Back Cover!

POPULAR AVIATION

FEBRUARY
25c

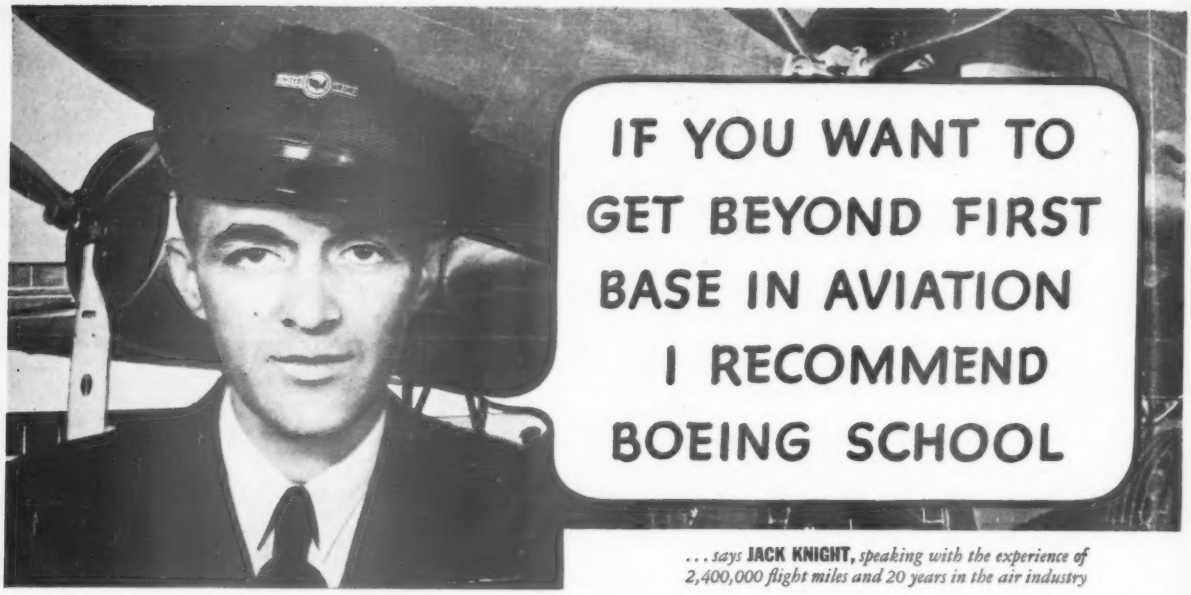
DOUGLAS DC-2
SEE PAGE 54

This Issue

GUNS *in the* SKIES

This EXPORT BUSINESS

★ *The Story of "Bristol"*



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(Nov. 1936—Oct. 1937)

Months	*Number Graduated*	*Number Placements*	*No. Co.'s Employing Graduates*
1936			
Nov. . . .	3	11	6
Dec. . . .	35	15	5
1937			
Jan. . . .	10	12	6
Feb. . . .	4	13	7
Mar. . . .	33	21	11
Apr. . . .	8	16	6
May . . .	1	16	6
June . . .	34	14	8
July . . .	5	7	2
Aug. . . .	4	2	2
Sept. . . .	20	17	7
Oct. . . .	4	3	2
TOTAL . .	161	147	27

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It costs you nothing to get the facts, so—*Mail the Coupon Now!*

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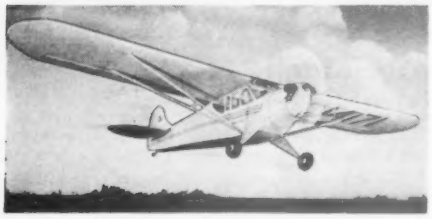

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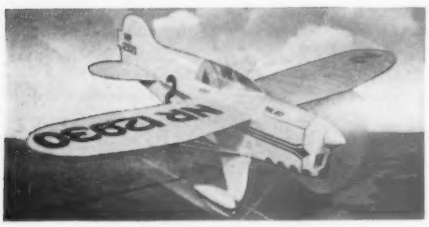

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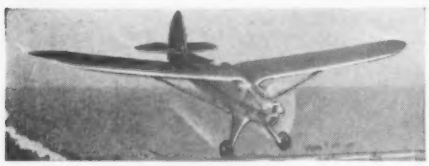

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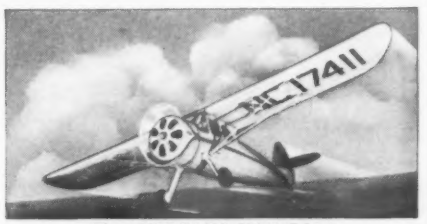

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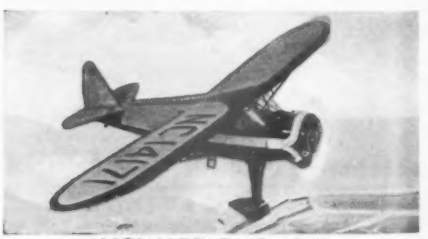

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LOOK ←

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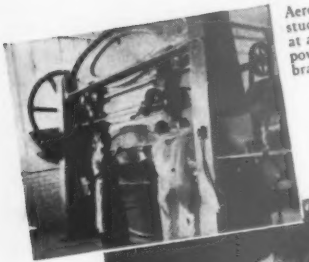

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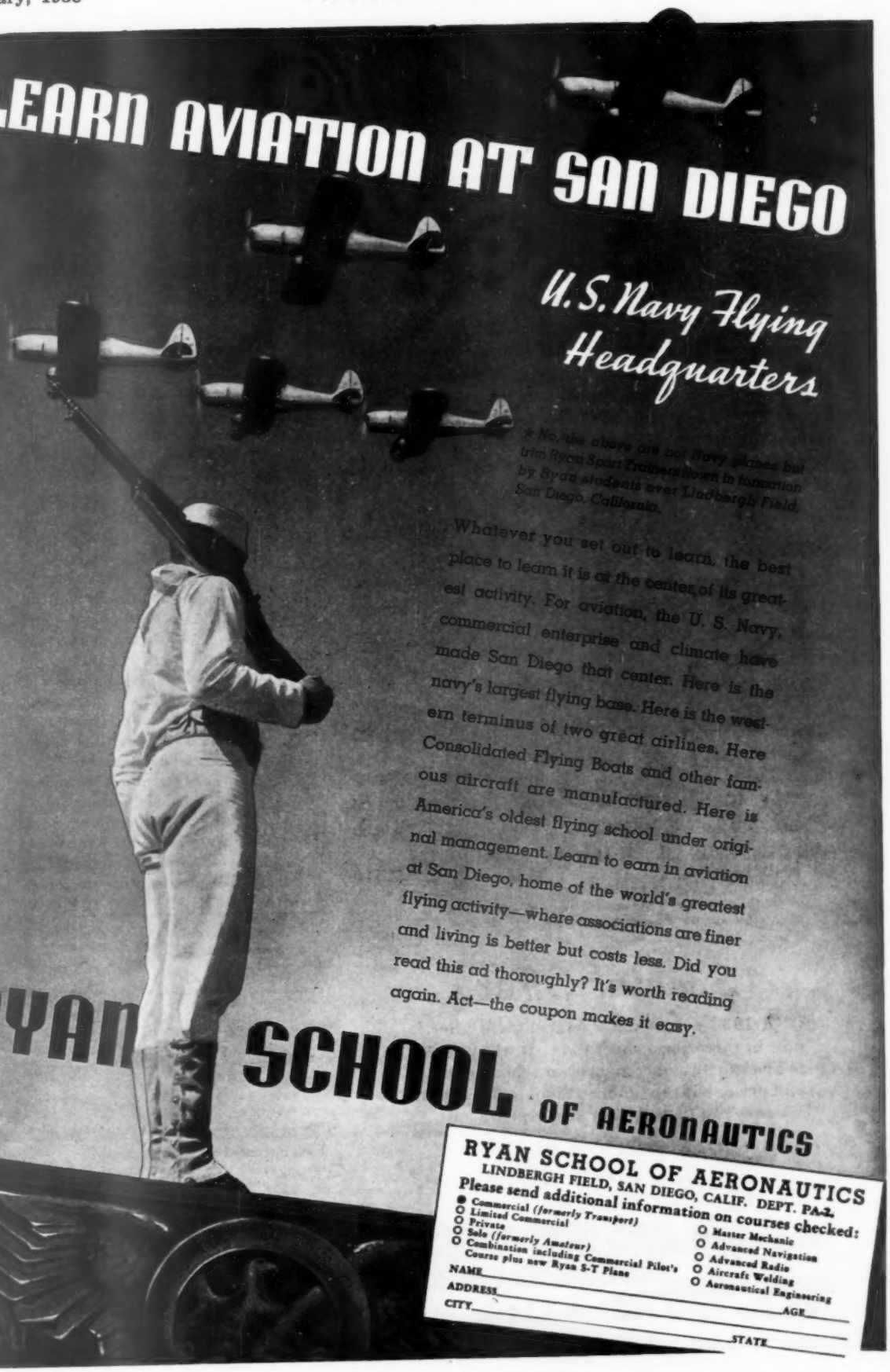

* No, the above are not Navy planes but trim Ryan Sport Trainers flown in formation by Ryan students over Lindbergh Field, San Diego, California.

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Volume XXII FEBRUARY, 1938 Number 2

FOR THE PROMOTION OF PRIVATE FLYING AND COMMERCIAL AVIATION

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WITH MOST of a hard winter behind us and with spring just ahead, amateur builders and private pilots are feverishly planning bigger and better flying activities for the coming flying season.

One thing that makes us believe that the amateur will put up a better showing this season than during the past five years, is the fact that he has been gainfully employed most of the time and therefore has some real money in his jeans with which to purchase supplies and replacements for the old crate or else, under the most favorable conditions, a brand new ship. Our old friend the private pilot has more money to spend and, beleive us, he'll spend it this year.

* * *

WE only wish that there was a suitable A.T.C. kit assembly available for the beginner so that he could assemble his ship from approved parts at a moderate price and openly enter into the flying game without the necessity for unauthorized bootleg flights as in the past.

Such kits, assembled under P. A.'s formula advanced several years ago, would greatly promote the cause of amateur aviation in all parts of the country. In short, this P. A. suggestion advised the production of a partly assembled kit-set made of approved materials. It was to be later checked and O.K.'d by a local licensed airplane mechanic after its assembly. This plan would effectively eliminate the use of defective materials, poor workmanship or the use of dangerous untried designs.

We have every reason to believe that the Bureau of Air Commerce will cooperate with the designers and producers of approved kit-sets and that this part of the program could be worked out very nicely by a responsible manufacturer or the original manufacturers who held licenses for the assembly of the kit-sets.

* * *

THE writer, who has developed and sold all sorts of amateur kit-sets ranging from home-built automobile kits, lightplane kits and radio kits to television kits,

(*Concluded on page* 82)

TWENTY YEARS OF GUNS IN

Browning nose gun on old LB-7.

ON August 22, 1914, an inoffensive-looking Farman, complete with skids, bicycle wheels, the usual tangle of piano wire and two jaunty and intrepid airmen who signed their mess chits "Lieutenants L. A. Strange and Penn Gaskell," took the air in search of glory. An equally inoffensive German Albatros had been spotted making its way toward Maubeuge aerodrome and Messrs. Strange and Gaskell, jointly removed handkerchiefs from their sleeves, chuckled twice with commendable restraint into their cuffs and exchanged glances of justifiable satisfaction.

"For King, Country and the Honor of the Regiment, Gentlemen!"

The Albatros bloke was in for something of a shock. Messrs. Strange and Gaskell quietly affixed one (1) Lewis machine gun to the front of the orange-box arrangement quaintly known as a nacelle. The two British gentlemen frankly admitted malice aforethought. They'd show that German-sausage blighter which side his bread was buttered. R. F. C. airmen used that sort of language in those days.

Unfortunately, Messrs. Strange and Gaskell had not made a careful computation of their load and in spite of Strange's best efforts and their combined program of profanity, the old Farman could not be persuaded to elevate itself any higher than 3,500 feet.

The German gentleman, completely unaware of the fate that had been planned for him, simply tootled about at 5,000 feet probably wondering what that horrid-looking contraption was doing 1,500 feet below. He was perfectly satisfied with his lot. He was getting in a few more hours on his log book, and how they loved their air-time in those days!

To be truthful about this Great War epic, we should add that Penn Gaskell *did* fire one short burst at the tootling Albatros bird, but the actual result was so astonishing, so unbelievable, that Pilot Strange hoiked the outraged Farman into a zoom that almost tossed Mr. Gaskell out of the nacelle.

As far as is known, Mr. Gaskell never got over it and little has ever been heard of him since. Strange, of mighty stuff, carried on somehow, came out of the war with a flock of decorations four feet long and a Lieutenant-Colonelcy. He is the same gentleman who a few months later startled the whole German Air Service by appearing suddenly out of a cloud, hanging by one hand to his top-wing Lewis gun while his Martinside flew about in circles on its back.

But that's another story.

After that first thunderous burst, Strange opened his eyes, gingerly moved around in his seat and satisfied himself that the engine was still in the bearers. Then he counted his wings and finally shoved his lower jaw back into place and stutteringly called it a day. They got back, because the law of gravity had been clearly defined and walked away from the winged monster and made no official report on their indiscretions.

Before midnight an official order ran up and down the British front to the effect that no more Lewis guns were to be mounted on any aircraft and that if any armament was required would the observers please confine their experiments to service rifles.

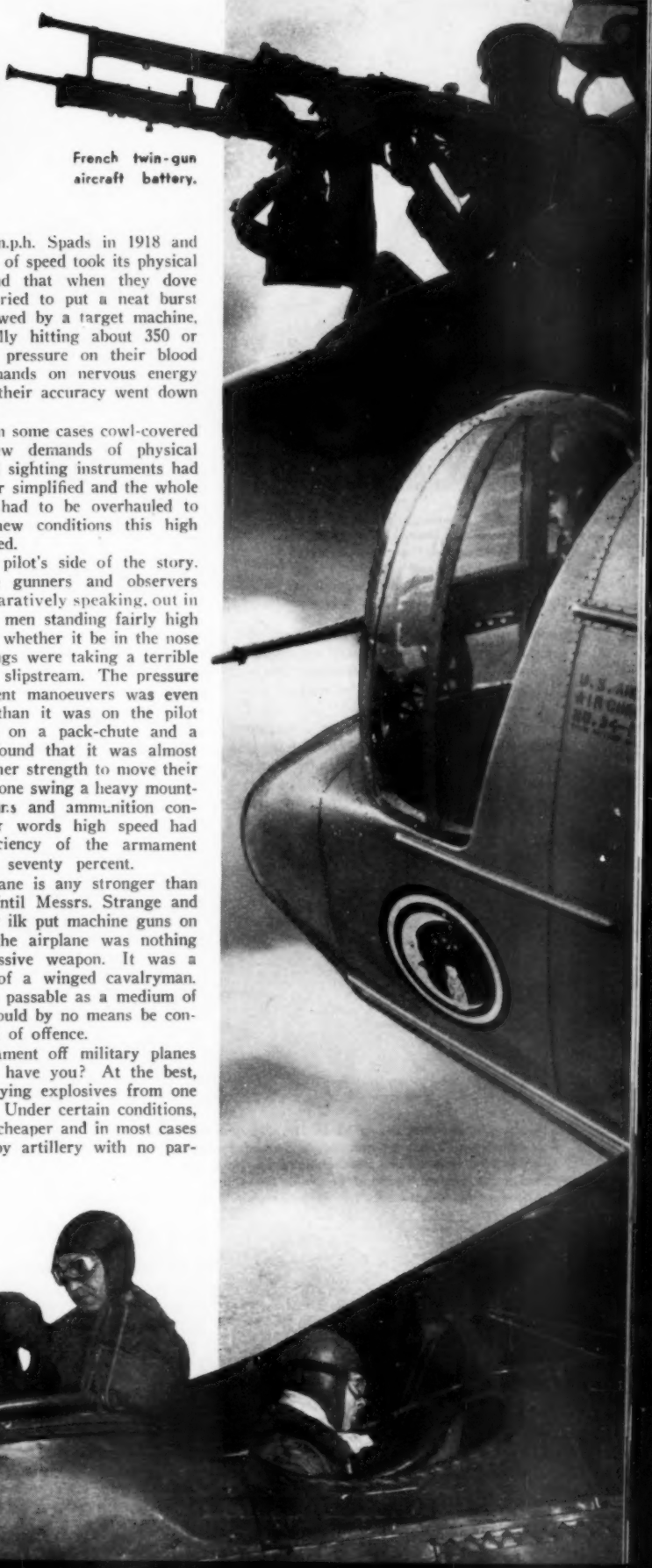
But war history discloses that that humorous incident did not end the experiments. Later they fitted Lewis guns to the Farmans and sent them into the air while Messrs. Strange and Gaskell did not know it at the time, and probably didn't care; they had set the stage for the greatest problem military aircraft designers have had to face, namely the mounting of and planning for suitable armament.

Many of the problems were solved during the Great War. The successful synchronization of a fixed gun to the revolutions of the propeller, for instance. Then

There is little change from the Browning on the Keystone and those on this North American.

By ARCH WHITEHOUSE

THE SKIES



French twin-gun aircraft battery.

they perfected a movable mounting suitable for use by a gunner. They increased the fire rate of many types of guns and developed a fairly accurate method of gun-laying. Ammunition for various types of targets was evolved, gunners received specialized training and their weapons were lightened and simplified so that mechanical stoppages could be remedied with a minimum of effort.

By November, 1918, military aircraft and its corresponding armament had reached a high standard of efficiency. So high, in fact, that it was fully ten years before any further improvement could be noted anywhere. It is true that guns had been speeded up from 650 rounds per minute to 1,000 slugs per second. They were a trifle lighter and built specially for aircraft purposes. The synchronization gear in this country had been changed from the Constantinesco hydralic system to a particularly efficient electrical device. Manual loading and stoppage-clearing gears had been invented and in one or two cases designers had improved the flexible mountings used by observers and gunners.

So far, so good. All this fitted into the scheme of things where aircraft speed had been raised from about 120 m.p.h. to nearly 200 m.p.h. Actual conditions from the late war days had not changed a great deal. But aircraft and engine design was running away from armament progress. Motors producing 600 and 700 h.p. were *not* blowing off their cylinders in the order of firing. They were staying in the bearers. The superchargers were producing the stuff and not throwing their vanes all over the sky. Out of nowhere came pursuits that were hitting 250 and two-seaters that sneered at anything under 200.

It was all very well. It looked great on paper and in the model plane advertisements, but unfortunately the designers of aircraft were still dealing with the human element. The men who were flying these 250 m.p.h. machines were made up in the same biological formula as the men who had flown 120 m.p.h. Spads in 1918 and this sudden burst of speed took its physical toll. Pilots found that when they dove on targets and tried to put a neat burst into a drogue towed by a target machine, they were actually hitting about 350 or 400 m.p.h. The pressure on their blood systems and demands on nervous energy was terrific and their accuracy went down in proportion.

That brought in some cases cowl-covered cockpits and new demands of physical standards. Fixed sighting instruments had to be improved or simplified and the whole tactical formula had to be overhauled to cope with the new conditions this high speed had provided.

That was the pilot's side of the story. What about the gunners and observers who were, comparatively speaking, out in the cold? These men standing fairly high in open cockpits, whether it be in the nose or aft of the wings were taking a terrible beating from the slipstream. The pressure in dives or violent manoeuvers was even worse on them than it was on the pilot who was sitting on a pack-chute and a cushion. They found that it was almost impossible to gather strength to move their own bodies, let alone swing a heavy mounting with two guns and ammunition containers. In other words high speed had reduced the efficiency of the armament equipment about seventy percent.

No military plane is any stronger than its armament. Until Messrs. Strange and Gaskell and their ilk put machine guns on their Farmans, the airplane was nothing more than a passive weapon. It was a glorified mount of a winged cavalryman, and as such only passable as a medium of observation. It could by no means be considered a weapon of offence.

Take the armament off military planes to-day and what have you? At the best, a device for carrying explosives from one point to another. Under certain conditions, this can be done cheaper and in most cases more efficiently by artillery with no par-

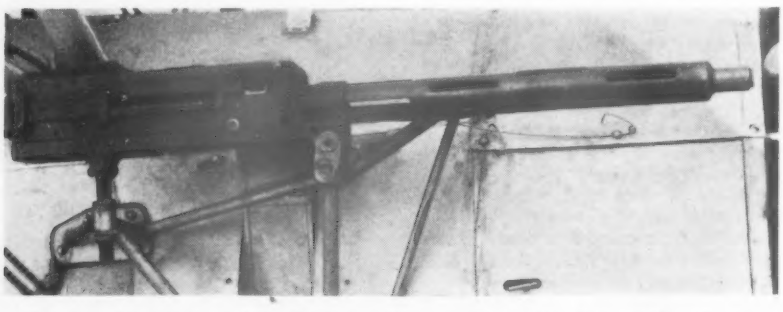
The gun in the Martin's nose (center panel) compares with that on the old Falcon below.

Though the mounting above is the latest, there has been little change in the basic guns themselves. Inset is an early wartime mounting that fired through the propeller. Compare these two representative types.

ticular risk to those directing the fire. As soon as you place a gun aboard an airplane it instantly becomes an offensive weapon. Its targets are only limited by its fuel consumption.

Next to the motor then, the machine-gun is the most important piece of equipment aboard the modern military plane. Without it, the plane is practically worthless as a weapon. During the war men would willingly risk going over the line with an ailing or sluggish engine, but I never knew one who knowingly went over with an ailing gun. From personal experience I never gave a spluttering motor much of a thought, if I had height and sight of my own lines, but jammed guns would make a jibbering coward of me.

Bringing this article up to date, let us look over the devices that designers have had to furnish to maintain the efficiency of the guns and the crew. We must admit that the guns have been improved to an unbelievable standard of efficiency. The ammunition is practically perfect. Both pilot and gunner receives a course of gunnery training that would make a World War program of schooling look like a tooth-brush drill at Miss Inglenook's Nursery Kindergarten.



Compare the guns shown here. The upper is mounted on a ship of the 1920s while the lower Browning is the gun also shown at the top of this page. Though several details on the lower gun have been cleaned up, the similarity to the older gun is clear. Among the additions on the gun below is the chute down which fired shells fall. In the gun above the empty shells were thrown toward the wings as they were fired.

The first reaction we have discovered, came about 1932 when the British Bristol firm came out with their "120" general-purpose biplane which had a transparent turret mounted on the rear gun ring. The explanation was that it would protect the gunner during high speed dives and enable him to obtain greater accuracy. Like all innovations of this sort the Bristol-120 was promptly dubbed the "Flying Greenhouse" but the idea stuck in spite of the fact that some of us war-time birds pooh-poohed the device and intimated that the R. A. F. must be getting soft. Shortly after, the French Amiot 124 Bp.3 came out with a shelter-effect wind-screen set between the pilot's cockpit and the run ring. This served to protect the gunner somewhat too. They copied the idea on the Breguet-27 and a later model, the Breguet-41 came out with a small framed tail and a covered turret for the gunner, in which Mons. Chattelerault grinned out to the rear like a night-watchman guarding a street excavation.

The Italians showed their stuff the same year in the Caproni "97" which they called a Colonial monoplane, in which they bolted a circular turret on the upper langerons, through which was poked a Lewis gun. This was a somewhat shallow and transparent arrangement and reminded one of those glass domes protecting wreaths we see in Italian cemeteries. However it seems to have served the purpose.

A study of American military craft of this era discloses that Boeing went in for what seems to be one of the earliest forms of covered cockpits on single-seaters when they tried out a special P-12E with a folding arrangement which carried either glass or some non-shatterable transparent material. Curtiss joined the fun with sliding cockpit covers on the Falcon O-39, the *Helldiver*, the O-40 *Raven* and the *Shrike*. The Douglas O-38 had the cockpits covered with a sliding device as did the Grumman FF-1. Vought did not incorporate the idea until the following year.

Going over this again, we see that the idea of protecting the gunner was being considered as early as 1930 by several concerns but it must be admitted that the Bristol "120" greenhouse idea was the most advanced and possibly the most efficient idea of the time.

Since those days, we have seen how the protected cockpit idea has advanced to the extremely formidable looking gun turrets which revolve with corresponding movement of the gunner. Many of them are in many respects miniature armored fortresses—flying tank turrets to be more exact. Summed up, they represent a composite picture of the effort of designers everywhere to beat "dat ole debbil" pressure, as it affects either pilot or observer. Unfortunately we do not have either time nor space to go into this subject further, but a glance over a representative group

of these turrets as shown in the accompanying illustration will bring a general idea of the trend.

But what about the guns?

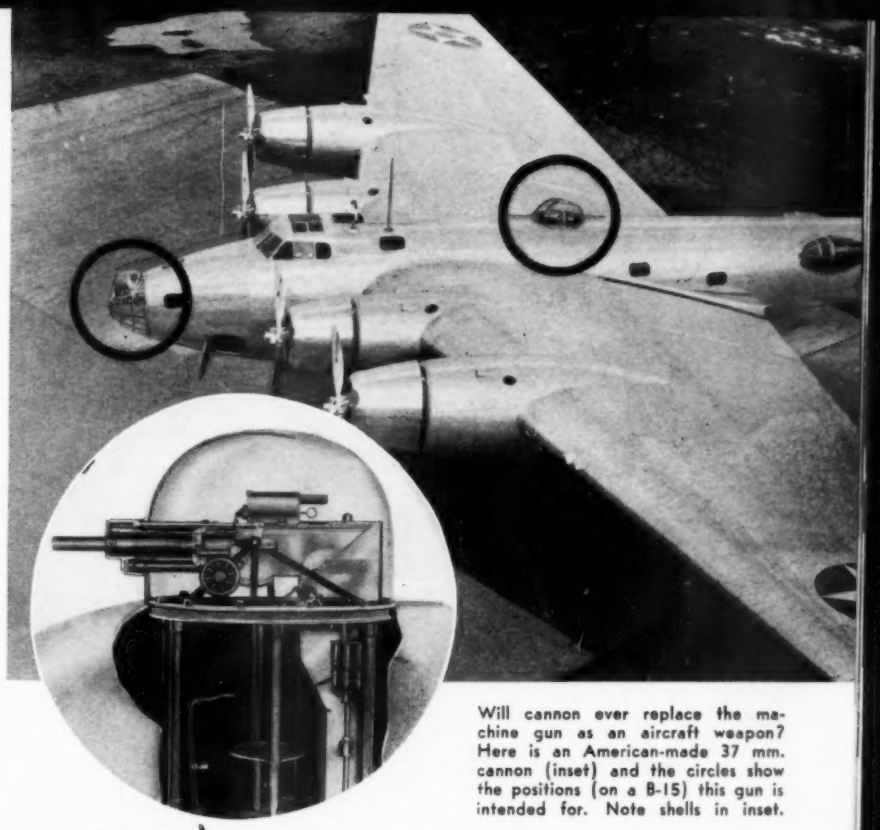
Wading in with my eyes open, I realize full well that I shall be accused of something between treason and total stupidity when I state that since 1918 there have been no startling improvements in the machine guns used aboard military planes. The mountings have been speeded up, the ammunition possibly has been of a higher grade (mainly because the manufacturers have been working under the comparative luxury of peace-time production pressure) but the guns themselves have shown very little actual improvement.

The average speed over a range of seven or eight modern guns is little better than that enjoyed (?) in 1918. They have been generally simplified for air work. They have been stripped of the parts which were only useful on ground weapons and most outside fixtures which were of no value to the pilot or gunner. They look neater and have what we humorously term streamlined, but they all use the same bolt actions, the same sequences of mechanism and the two same general processes of automatic action. The old wartime barrel casings, usually cut-down portions of the ground water- or air-cooling portions have been replaced with plain slotted casings which in no way improve the efficiency or accuracy of the gun. They simply make it "look better."

The air cannon business we hear so much about is a myth as far as the United States is concerned. At this writing there is no service plane in this country equipped with an air cannon of any kind. One or two have been tried out as an experiment, but according to the manufacturer of the only air cannon made in this country, no plane in squadron service is so fitted.

There are reasons for this of course. From what we can make out, the 37 mm. cannon, while it has a high rate of fire and theoretically is a terrible weapon, does not fit into the modern plane as yet. For one thing, the American air cannon weighs 250 lbs. with its mounting. A clip of five rounds of ammunition weighs more than eight pounds. Fully 200 rounds would have to be carried to make the weapon worthy of the space and load it takes up, which will add approximately another 350 pounds. All told then, the gun actually weight 600 lbs. Another feature which American officials seem to find fault with is the low muzzle velocity, 1,250 feet per second. They appear to assume that this is not fast enough to compete against an attacking ship using guns spraying lead at a rate of 1,000 rounds per minute.

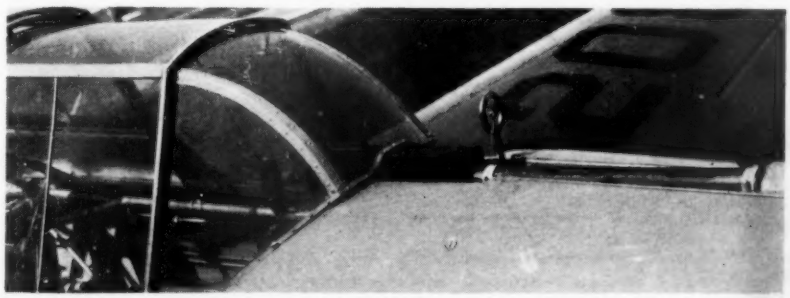
The argument revolves about a very delicate point of ballistics from what we can understand of the items introduced. One side declares that an air cannon must have a high muzzle velocity to score direct hits on the enemy target, while the manufacturer stresses safety in operation, to prevent accidents because of the use of supersensitive nose fuses; and the assurance of effective destruction once the target is hit. If the shell is travelling at very high speed—in spite of the use of supersensitive nose fuses—the full effect of the exploding shell will not take place at the desired instant. For instance, should a 37 mm. shell strike the thin fabric of an enemy wing, the supersensitive fuse *will* detonate the charge, but if the shell is travelling at relatively high speed. it will have passed through the wing and will explode at some distance beyond, causing very little damage. A direct hit of course on a motor or the more solid portions of the cockpit, will no doubt offer the desired results.

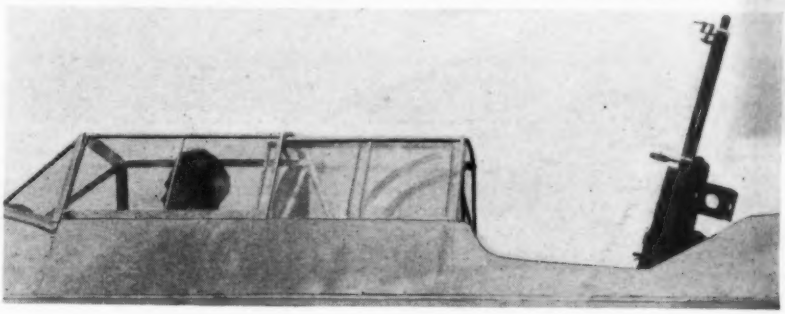


Will cannon ever replace the machine gun as an aircraft weapon? Here is an American-made 37 mm. cannon (inset) and the circles show the positions (on a B-15) this gun is intended for. Note shells in inset.

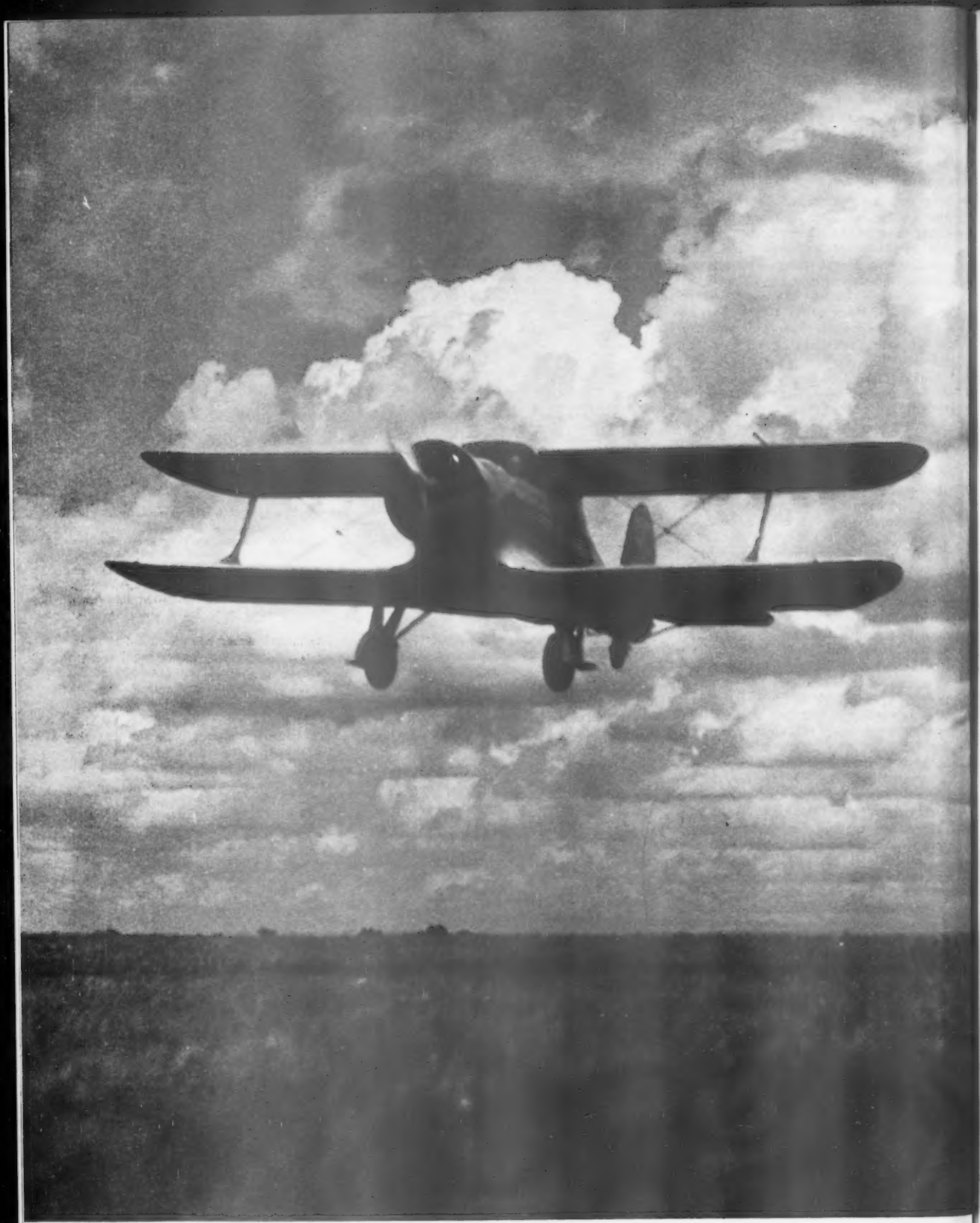
The manufacturer has attempted to overcome this objection by increasing the length in calibers of the barrel, from 20 to 50. This has increased the muzzle velocity from 1,250 feet per second to 2,700 feet per second. Whether this increase satisfies is not known, but we do know that the increased barrel has been found too long and cumbersome for modern military practice.

(*Concluded on page 74*)





Though the machine gun mounting on this new North American attack ship is the latest, the gun itself is only an adaptation—with a few improvements—of the machine guns of 10 years ago. Because of high speeds, gunners must have the protection of a wind shield like that shown above. This shield can be slid back and the gun put into action (below) easily and within a few seconds. Note wide range of fire.



COMING HOME TO ROOST

RUBBER-TIRED arms outstretched to welcome the return of the earth, this proud Beechcraft comes home after long, pleasant moments of sweeping gaiety among the towering wonderland of clouds high above. Photographer Cy LaTour's ready lens recorded her return.

Supplies Overboard!

by S. R. WINTERS

Parachutes can save human life in more ways than one. Here is another much-used method.

TO relay eggs, milk, canned goods and fire-fighting equipment speedily to men fighting fires in remote national forest areas, the Forest Service of the U. S. Department of Agriculture has been experimenting with the dropping of such supplies in home-made parachutes from airplanes.

The makeshift parachutes are contrived of sacking material of burlap and wool by the Civilian Conservation Corps enrollees in forest camps as part of their required activities. The parachutes have a spread of about six feet and their cost is nominal; about 40 cents apiece.

Until experiments with 'chutes were initiated, drums of water and gasoline, crates of eggs and milk, and other commodities were dropped by dead weight. Dropping supplies in parachutes has been found to be a better method.

The nature of the supplies dictates the mode of packing the parachutes. If eggs are to be plummeted to earth, bread is usually placed in bottoms of the sacks to break the landing jar. If bedding is needed in camps of the fire fighters, it is put in the bottoms of the sacks and breakables packed on top of the material. In dropping canned goods and perishable foods, the cans are placed in the bottoms and the perishables on top.

Parachutes are used also to carry saws, axes, and other hand fire-fighting apparatus and are dropped in the same manner as foodstuffs.

The federal government, since 1920, has been employing airplanes for transporting men and equipment quickly to fire-raging areas where landing fields have been established. Uncle Sam hires, by contract, planes from commercial flying concerns on a per flying hour basis. Aircraft companies furnish the pilots, and the Forest Service furnishes observers and guides familiar with particular areas and locations of landing fields for men and commodities. Cabin planes are used, and the parachutes are dropped from the door in such manner as to clear the planes.

As early as 1920, the Federal government used airplanes for scouting and reconnoitering to determine in which direction forest fires were traveling and how fast they were spreading.

Experiments in commercial parachute dropping of commodities have been carried on for the last five years, mostly in the western states, and have proved successful in actual fire emergencies in isolated sections. It is the intention of the government to continue the experiments with these home-made parachutes, ordinarily used in sacking wool.

The transporting of supplies by plane to fire fighters in isolated regions is a far cry from the old method of sending trucks over the nearest road and at its end transferring food and fire-fighting equipment to pack animals.

In starting out to fight fires in the national forests, the rangers and their men usually take foodstuffs to last them from one to two days. After that, they

Food and blankets go out the plane door.

Forest rangers receive supplies in this manner. The milk below arrived unharmed.

Airplanes and parachutes are the fastest means of getting emergency supplies to a fire zone. Here is a plane being loaded for an emergency fire-flight.

are dependent upon what is brought to them.

From January 1 to October 1 of this year, fires in national forests totaled 10,471—7,024 in the six western areas, including Alaska, and 3,447 in the three eastern regions. Alaska only had nine fires.

The total average number of fires for the 10-month periods for the five previous years was 8,912—5,829 in the western and 3,083 in the eastern areas.

Although the number of fires thus far in 1937 is greater than the total average for the previous five years, the number of acres burned was held to less than a third. The figures for 1937 are 95,251 acres against 323,228 acres for the previous five years. Of these total acres of burned areas, 34,130 were in the six western regions against 226,418 for the previous five years, and 61,121 in the three eastern regions against 96,810 for the previous five years. Of the total 10,471 fires in national forests so far this year, all but 204 were under control within the first 24 hours.

According to the Forest Service, the 187,122,400 acres nationally-owned land needing protection are safeguarded, but not quite two-thirds of 494,014,000 acres of private and state forest areas needing surveillance are actually protected by organized fire-control systems,

In the drought year of 1936, nearly a quarter of a million forest fires occurred in this country, which caused damage estimated at $54,000,000. Ninety per cent of all acreage burned was on unguarded areas and nearly 20 per cent of all unprotected forested land was burned over. The 141,432 fires in 1936 on unprotected lands burned 38,990,000 acres of forest cover at a damage estimated at slightly over $40,000,000.

END

These vital supplies and blankets have been parachuted to a fire-fighter.

The Story of a Braggart

WARD T. VAN ORMAN, world famous balloonist, in writing a diary of his ballooning experiences from the early war days up until the last Gordon Bennett race, in which he landed in the Canadian wilderness, has one short chapter in his recollections which he calls, "The Braggart".

With the release of his diary for publication, this little story furnishes one of the most amusing incidents in his career as a balloon pilot. It was while Van was serving as civilian instructor to student officers at the Naval Air Station, Akron, Ohio, that the incident occurred. He tells it in his own words,—

"'The braggart' arrived as a new student at the naval station and, within twenty-four hours had told everyone in the place of his remarkable record in the air. According to him, he had made more free balloon flights and parachute jumps than anyone in the United States. Particularly aggravating to his rather sceptical listeners was the statement that he had dropped through the glass of greenhouses many times although he bore no scars of these experiences.

"His bravado and boasting finally reached the point where the head instructor decided something should be done. He gave orders that the next pilot who took 'the braggart' aloft on a balloon training trip, should give him a real scare and see how he would act.

"Fortunately, or unfortunately perhaps, I drew the assignment. I knew the head pilot and the other pilots were watching to see what I would do with our boasting young friend, so I felt obligated to do something, though had no definite ideas as to what it would be.

"We left the air-station on a brisk west wind, carrying us towards Youngstown. An hour later, when Lake Milton appeared ahead, I was furnished with the inspiration of how to accomplish my obligation. I had to keep in mind of course that I had four other students besides the 'braggart' in my balloon basket.

"However, I recalled that one of the outstanding balloonists of the previous generation had once told me that a wicker balloon basket would come down on water and immediately bounce up again without any trouble. That would be a good test to make at this time, I figured, and at the same time I could give my young braggart with his wide (?) experience a new thrill.

"So down we swung to 100 feet over the ground, sweeping toward the lake at thirty miles an hour with the drag-rope cracking through the branches of trees as we passed. Approaching the lake, the balloon still continued to settle. Presently the drag-rope swished through the water and pulled the craft down till the basket touched the water.

"One of the students, rather alarmed, asked if he shouldn't throw over some ballast. I boldly said, 'No', and con-

(*Concluded on page* 97)

An Air Veteran

WRAPPING a shawl about her head as a protection against the cold breeze, a spry little 71-year-old woman trotted across the field back of her century-old farm the other day.

She mounted the steep rickety steps to an old barn loft, and there amid the cobwebs and shadows she pointed out two great rotary-type airplane engines of an early French make

She is Mrs. William H. Martin, R. D. 3, Canton, Ohio, the first woman, so it is claimed, and so records seem to prove, who ever flew an airplane solo.

"There used to be a third engine," she said sadly. "But after my husband died in March of this year, someone stole the third one."

She turned and looked through the high loft door down across the sloping hillside back of the barn. An old-fashioned peaked iron fence surrounds the whole property.

"There is where we flew the plane on that cold snowy January day—New Year's day, 1909," she said.

"He went up first—then I took it aloft," she added simply. "Afraid?—of course I wasn't. My husband built it, and what he made was good. I felt as safe as I was in my rocking chair."

We climbed down the steps again and went back to the old house, where by the flickering light of a kerosene lamp I looked over the papers of the first monoplane ever to be patented—and the few old pictures of that epoch-making day. Then the story came out bit by bit.

Martin as a youth had been a star debater at Brush College near his home, it seems.

One day in the late 1800's the subject of, "Resolved that man will some day fly," was suggested and Martin was put on the affirmative After reading up on the subject in the few books then available, the young man convinced himself, if not his hearers, when the debate was held, that he could some day take a "flying machine" aloft.

From that day he was launched on his strange career. His young wife later became his staunchest ally and helper.

Together, they struggled over the building of the craft in the barn machine shop. They made it 32 feet long, of V shaped monoplane type with balancing wings located below. By lantern light he worked over the wing angles, and intricate designs, while Mrs. Martin sewed the wings of old fashioned long cloth.

The plane, when finished, was simple but sturdy and the next job was to move it to the little hilltop behind the barn. Then the inventor crawled within the frail structure, his long beard blowing in the breeze, his faithful wife watching.

At this point in the story, "Old Bill" enters the picture. "Old Bill," the Martin farm horse was pressed into service since they had no motor for the plane as yet. A rope was tied to his harness and to the

(*Concluded on page* 86)

A Bomber Folds Its Wings

This is proof that all Douglas airplanes are not airliners. Navy bombardment pilots soon will be flying these novel, new ships off the decks of the carriers.

IT'S not exactly a common sight to see an airplane taxying along the ground and suddenly fold up a wing or two to roll through a tight spot. That is not what the latest system devised by Donald Douglas' engineers really is for, however. The new Douglas XTBD-1 (Experimental Torpedo Bomber Douglas Model No. 1) now being tested at the Dahlgren Proving Ground in Virginia by Navy test pilots, incorporates the folding wing feature for a far more practical reason.

The men who developed the aircraft carrier developed themselves into a problem that had aircraft manufacturers a little hard put for a while. In order to store airplanes based aboard carriers, it is necessary to lower them below decks on elevators. For the number of planes assigned to a carrier, some difficulty was experienced in getting fighters, bombers and observation ships all into the limited space. Folding wings answered the problem—with biplanes. But folding a sleek monoplane s wings was something else again. Designers and engineers worried themselves into a lather trying to devise a folding wing for the new big high-speed ships. Of all recent results, Douglas' is by far the most novel. And, judging from the attention Navy men are paying to the XTBD-1, the most practical. Of course, one who is familiar with the old tried-and-true designs is inclined to stare a bit dubiously at a big warplane that can fold its wings with such ease. A handful of *lucky* old time pilots know that, when a monoplane's wing fails in midair, it folds up just about like the pictures below demonstrate. But Douglas engineers have assured doubtful higher-ups their device is safe. So, Lieutenant, just lower your hook and wheels, head for the deck, land, flip up the wings and leave her.

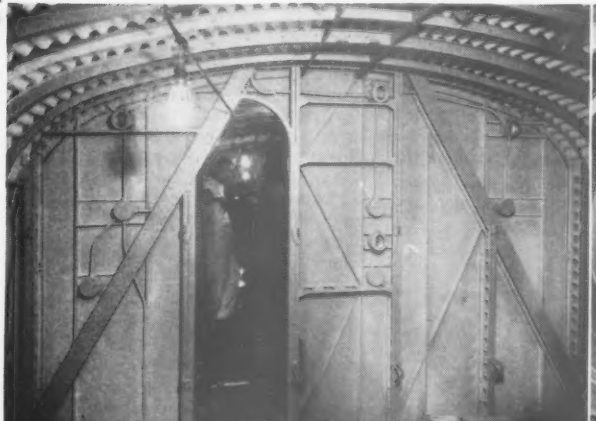
The pilot can taxi down the deck this way, crank down the wings, lock them, give her the gun and fly gaily off.

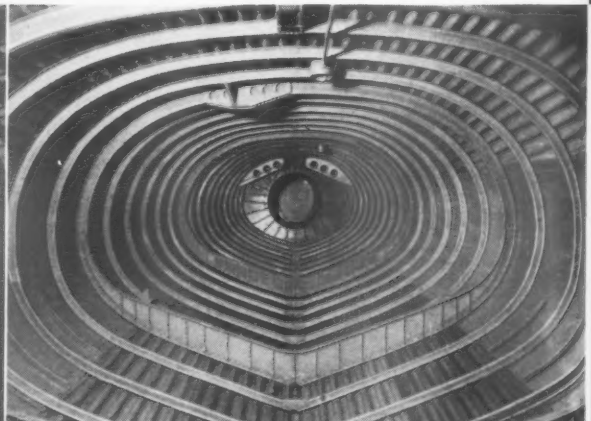
Russia

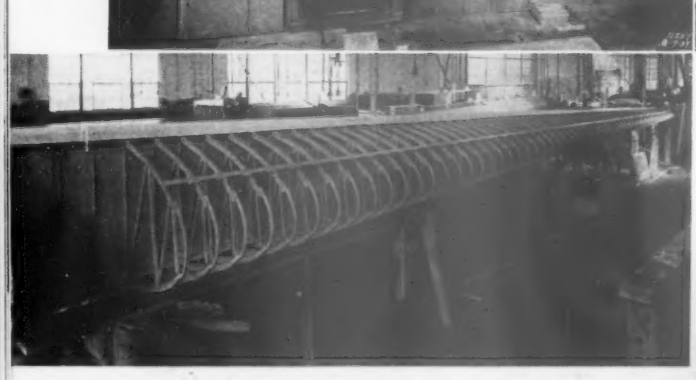
Finishing touches go on the new ship.

The Martin flying boat above looks a lot like China Clipper, is a far better money-maker.

Below are two fuselage sections. At left is a watertight bulkhead. Directly below you look toward the tail.

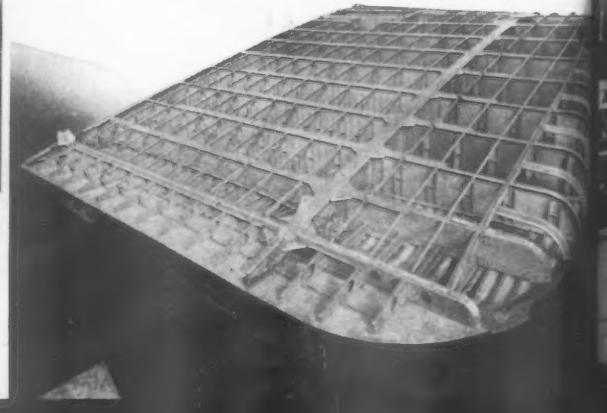






This is the Clipper's huge wing under construction. A smooth metal skin covers the corrugations underneath.

Below is one of the two "water wings" which carry the Ocean Clipper's 4,260 gallons of gasoline.



BUYS A CLIPPER

by JOHN LEEDY

This is the Martin boat that has been drawing comment during the past few months. Famed China Clipper has nothing on this bigger, faster, more economical airliner.

VARIOUS maritime interests are planning ocean airliner service between the United States and Europe. They confidently expect to make money in the enterprise—for a mechanism designed to fly across oceans non-stop with a payload has been built.

Recently, W. H. Coverdale, prominent transportation consultant, head of Coverdale and Colpitts, president of Canadian Steamship Company, and president of American Export Steamship Company (whose interests are now considering over ocean air transport service) viewed the immense Martin Ocean Transport at the Glenn L. Martin Company plant in Baltimore and said:

"This giant flying boat puts the United States face to face with another important evolution in its foreign trade and maritime system. We are in a transitional period where our merchant marine in order to keep pace with the type of service demanded by the traveller, shipper and mail user, must take advantage of the added speed made available by boats with wings in such a way as to offer a well rounded transportation service coordinating the airplane with improved and more economical ocean vessels."

Mr. Coverdale has a keen appreciation of efficiency in the realm of ocean transport. He looks at equipment as a business man of broad experience and with the trained eminence of a successful ocean transport operator.

His statement pays high tribute to the achievement of Glenn L. Martin in building the Martin Model 156, taking cognizance of the importance of the successful completion of the huge aircraft, which is the most efficient long range flying boat for over-ocean flights with real payload capacity ever built. The remarkable efficiency of the great aircraft is well reflected by her weight statistics and range with payload figures.

Gross Weight: 63,000 pounds.
Disposable Load: 32,586 pounds.
Weight Empty: 30,414 pounds.
Payload Fuel and Oil: 30,458 pounds.

The new Martin Model 156 has a disposable load of over half (approximately 52 per cent) of its 63,000 pounds gross weight. In other words, without overloading, it is capable of taking off and cruising easily with a useful load more than equal to its own empty wegiht.

Over the *China Clipper's* 2,410 mile non-stop flight from San Francisco to Hawaii, the new Martin Ocean Transport, carrying *285 per cent more payload,* can fly the distance in three hours less time.

This ship has a non-stop over-ocean maximum range of 3,500 (route miles) to 5,000 (still air miles).

The liner's capacity for swift Atlantic transport is revealed by a maximum speed of close to 200 m.p.h.

Cruising speeds of 145 to 170 m.p.h. make possible a trip to London in a day and a night.

Nearly three years ago the now-famous Martin-built *China Clipper* and her two sister ships, the *Hawaii* and *Philippine Clipper,* went into service maintaining regular Pacific schedules.

Now the new Martin Ocean Transport, of similar design but greatly improved, has been built with a capacity to span the Atlantic with a payload.

A good understanding of the forward stride in ocean transport which this new Martin 156 represents may be had from a comparison of the two ships:

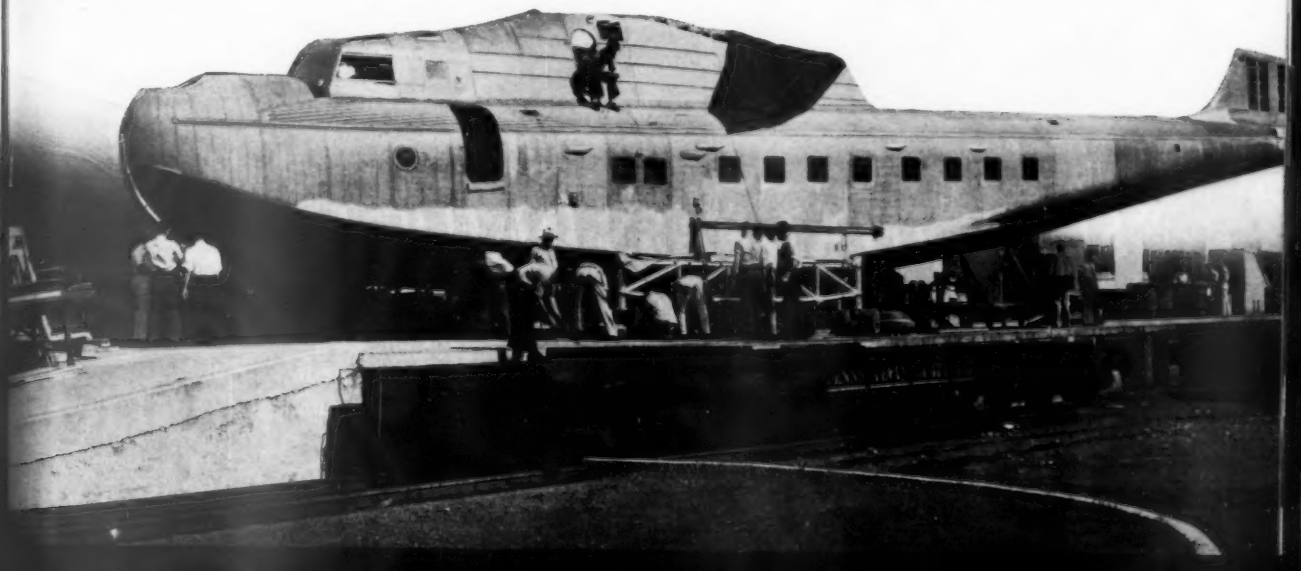
CHINA CLIPPER	RUSSIAN CLIPPER
Model 130	Model 156
Gross Weight	
52,000 pounds	63,000 pounds
Wing Span	
130 feet	157 feet
Overall Length	
90 ft. 10½	91 ft. 10 in.
ENGINES	
Make	
Pratt & Whitney	Wright "Cyclone"
Motor Rating	
830 h.p. @ 6,500 ft. @ 2,400 r.p.m.	850 h.p. @ 5,500 ft. @ 2,100 r.p.m.
Number	
4	4
Take Off	
At 52,000 lbs., using 950 h.p.—38 seconds	At 63,000 lbs., using 1,000 h.p.—35 seconds
Cruising	
600 h.p. @ 12,000 ft. @ 2,180 r.p.m.	600 h.p. @ 12,000 ft. @ 1,900 r.p.m.
Carries payload of 3,500 lbs. for 2,410 miles against a 35 m.p.h. headwind at 130 m.p.h. airspeed.	Carries payload of 10,000 lbs. for 2,410 miles against a 46 m.p.h. headwind.

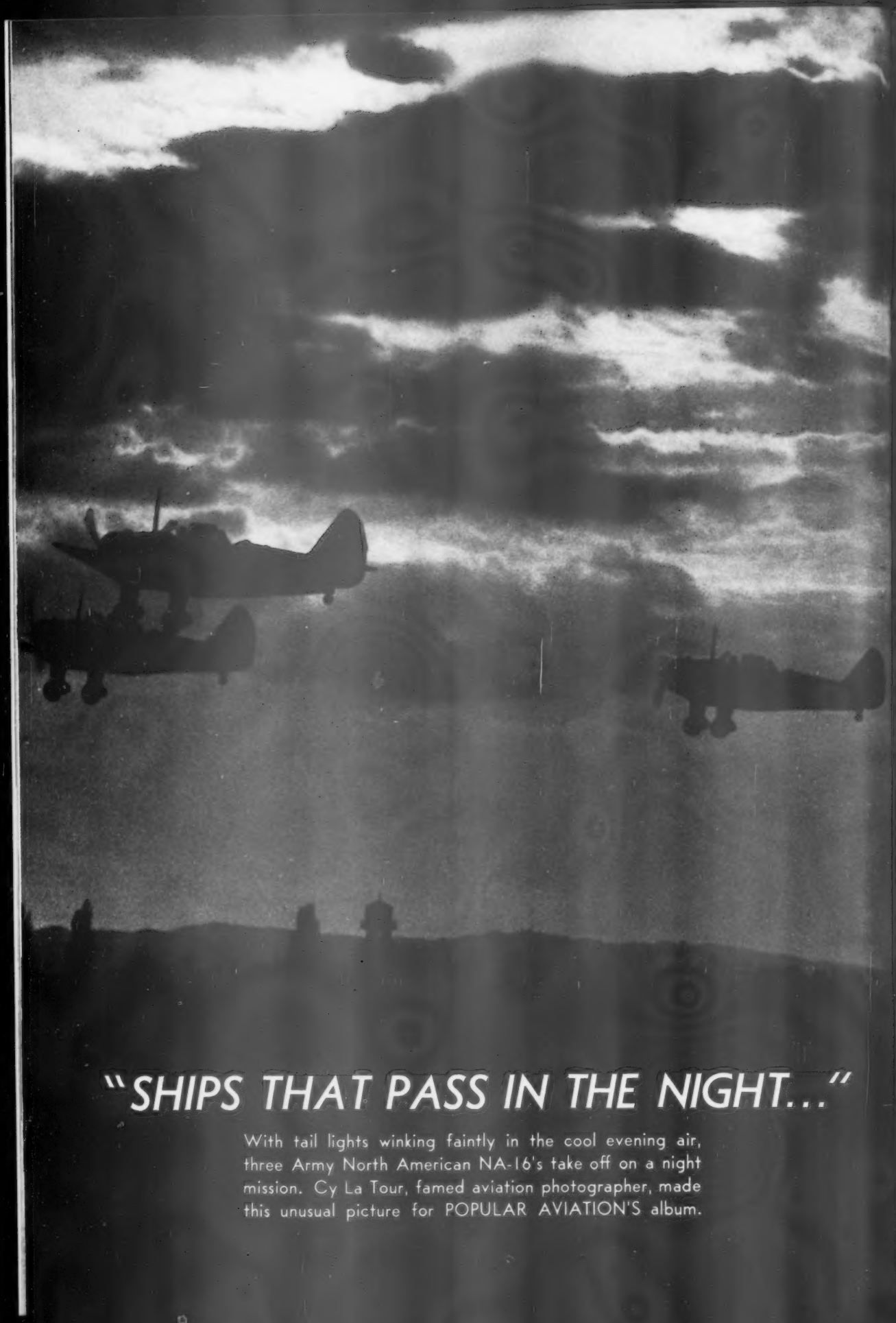
The seawings hold 4,260 gallons of fuel and contribute to lift and stability. They also increase water maneuverability. The ship has the double rudder type tail surfaces.

Heating and air conditioning installations contribute to greater pasenger comfort. Three pasenger compartments and lounge seat 46 passengers on day flights and comfortably sleep 26 in roomy berths at night.

END

With the hull completed, it is moved outdoors, hoisted aboard a flatcar where wings and tail are then added.





"SHIPS THAT PASS IN THE NIGHT..."

With tail lights winking faintly in the cool evening air, three Army North American NA-16's take off on a night mission. Cy La Tour, famed aviation photographer, made this unusual picture for POPULAR AVIATION'S album.

THE LIEUTENANT FLEW THE MAIL

by
FRANK LAMBERT

A glimpse back into the black days of Jim Farley's 1934 fiasco.

TODAY he flies airliners back and forth between Texas and California. He wouldn't approve of my writing this so, in order to save him from possible embarrassment, I shall call him "Bud McCann." But if you ever travel over his route I hope you ride with Bud. He is the kind of fellow you like to see at the controls of anything that concerns your safety. Bud is bigger and more athletic in appearance than most pilots, but he keeps his head up and his eyes open in a way that tells you he doesn't depend on muscle to keep his ears apart. He seems to know what he is doing, what he has just done, and what he is about to do. And he does know, but he seldom tells you about it. You might know Bud for years and never hear the story I am about to repeat to you. He seldom talks about his flying. But if he ever decides to tell you one of his experiences in his own natural way, you won't soon forget it. I didn't . . .

In the operations office at Chicago we were talking about snow. It was a good time to talk about snow because there was plenty of it coming down outside. We had never seen so much bad weather, and never had there been a worse time for it. The Army had just taken over the air mail. It was a brand new job and a tough one and the newspapers were gleefully reporting every cancellation and making headlines out of every accident. We were sore. We cared nothing about the controversy over the mail contracts, since that was none of our concern. We had a job to do and we were doing it, despite the difficulties and the eagerness of the press to point to every accident as evidence that we were not doing it. While not pretending to do the job as well as the airlines with their specialized training and equipment and their years of experience, we did expect to run them a close second—and we were learning fast. Accidents were bound to occur. Military flying has never been as safe as commercial flying and is not expected to be. Fighting planes are not built primarily for safety. Many of our pilots were young reserve officers in the awkward and dangerous stage—just out of flying school. Due to a rigid economy program, cross-country training had been reduced and most of them had little or no flying experience at any great distance from their home stations. Economies of equipment as well as of cross-country training had resulted in both being less up-to-date than at present. Many circumstances were undesirable and uncomfortable for the pilots. But they were puzzled and annoyed by the sudden flood of sympathy when they faced difficulties they had always taken for granted. Army pilots had been getting killed regularly for years and little had been said about it. Fatalities, averaging about four a month, had been reported in small paragraphs somewhere in the big dailies. Suddenly they became headlines all over the country, and each victim became a "martyr." We could not understand what was making the public ignore the facts and figures. It did no good for the Chief of the Air Corps to point out that, despite the sudden increase in the amount of flying performed, the relative number of fatal accidents was actually *less* than it had been for normal military flying during recent years. The strangely guided or misguided press still screamed that these accidents were proof of failure.

Even the younger pilots were familiar with the risks of military flying. They knew the prodigious insurance rates (which have since been greatly reduced), that applied to first-year graduates of the flying school. Goaded by the pessimistic predictions and unfair criticisms of a suddenly adverse press they were eager, in many cases, to take even greater risks in order to get the mail through under all conditions and make good at their new job. During those first weeks of record-breaking bad weather (from which even the commercial lines suffered considerably) some of them died. The number was surprisingly small, less than it often had been for equal periods of normal flying. But these misfortunes were being used to discredit the efforts of the great number who succeeded in maintaining their schedules, and flights in doubtful weather were soon rigidly restricted. In the meantime, for every one who died there were hundreds who did not die, though they flew into and out of some very educational situations. Bud McCann was one who did not die.

We were standing by the heater in the operations office, watching the snow that was falling on the airport. Chicago was the coldest place we had ever seen. Some of the boys who came up from Texas in the middle of winter were seeing real snow for the first time, though most of us knew what it looked like from the ground and on the ground. We were not talking about how dirty and messy the snow was in cities like Chicago, nor about what flying in zero weather in an open cockpit can do to your face and hands. We were talking about snowstorms in the air, and about how the little flakes of whiteness that were falling so steadily and quietly could look so different from the cockpit of a plane. This was something new and somewhat surprising for most of us the first time we had seen it. Bud had been initiated at night, just a few weeks before. I knew he had always flown in warm weather until the northern mail runs began. At Galveston, on the rare occasions when the temperature had dropped below freezing, it had been necessary to drain the water from all airplane radiators and wait for the sun to warm things up in the middle of the day.

The pilot of a night plane sees snow not as little flakes, but as long, blurring streaks of white that threaten to blind his

vision of everything beneath. And a heavy storm does just that. He can't see a thing. With a good radio to guide him and tell him that he can depend on a few hundred feet of clear air at his destination, he may fly through on his instruments. Otherwise he may do one of three things; he may try to ride it out if he thinks it covers less than 10,000 or so square miles and his flight instruments are good and he has plenty of gas; or he may turn back, if it hasn't closed in behind him; or, as a last resort, he may try to land.

Bud was telling about a fellow who had tried to land the night before. He had not been lucky. They said he was a good fellow, too. We didn't know what had happened or why his airplane had dived into a cornfield. We didn't know what problems he had faced—no one did. Maybe he had motor trouble. But each of us felt that, had we been in his place, we would have done something else. We would have gotten out of it, or stayed out of it, or gone through it somehow. We had to feel that way. At least the fellows on the run from Chicago to Omaha had to feel that way.

"What's so tough about that run, Bud?" I asked.

"Oh, it ain't so bad." Four years of college had proved nothing but an interruption in Bud's manner of speaking. He talked as he wanted to talk, like the people in his native North Carolina hills, because he could express himself more effectively that way. "It's a nice run when the weather's good. Level country. But we've really had some weather. I've been getting gray-headed, no foolin'." He said he was getting used to it after a couple of months, but there were some anxious hours at first. As for the gray hairs—they were real enough, but I remembered he had a few of them the previous year when he had nothing to worry about but a persistent woman. Bud's unusual ability in more than one line had sometimes gotten him into trouble, but he could get into a difficult situation and out of it and learn how to stay out of it in less time than it takes most people to get themselves involved in the first place.

"Say," he said suddenly, in a way that indicated he had just remembered something amusing, "did you see where I got in the movies?"

"No. How do you mean?"

"Yeah, I got into the movies. Into the newsreel, I mean. You heard about me having that forced landing over in Iowa the other night, didn't you?"

"No, I didn't, Bud. Been so busy lately I haven't had time to read the papers and nobody told me about it. How did it happen?"

"Well, that's how come me to get into the movies. I thought I was about to get into a wooden box, though. Yeah, they got me to tell about how come I had the forced landing and what happened and everything. You may see the newsreel someplace. Wasn't much to it."

"What happened? You ought to be tired explaining it by now, but it might be educational. It's a cinch they aren't going to let us take off in this storm. Go ahead."

Bud took a deep breath. "Well, it won't take long. You see, this was before they put all these restrictions on taking off in threatening weather. They just let you use your own judgment. If you thought you could get through, you went ahead. Well, they reported a cold wave and snow coming in from up around St. Paul, but they didn't know just when it would hit. It looked like I could beat it across.

"But I hadn't much more than gotten out of sight of Chicago when the stars out ahead of me began to disappear. I knew it was clouding-up overhead, but I didn't know how fast. Right after I took off I had picked up the hourly weather report on the radio and everything was O.K. all the way to Omaha. So I kept on going. After a little while it began to look like the beacons were going by awful slow. When I checked up on my ground speed I found out there was a hell of a head wind, 30 or 40 miles an hour at the altitude I was flying. Pretty soon the air began to get rough as the devil. That worried me some, but the weather still looked good, so I opened her up a little to keep the headwind from slowing me down so much and kept on going.

"Gracious, Jimsie-Wimsie, do you *have* to do that to get your license?"

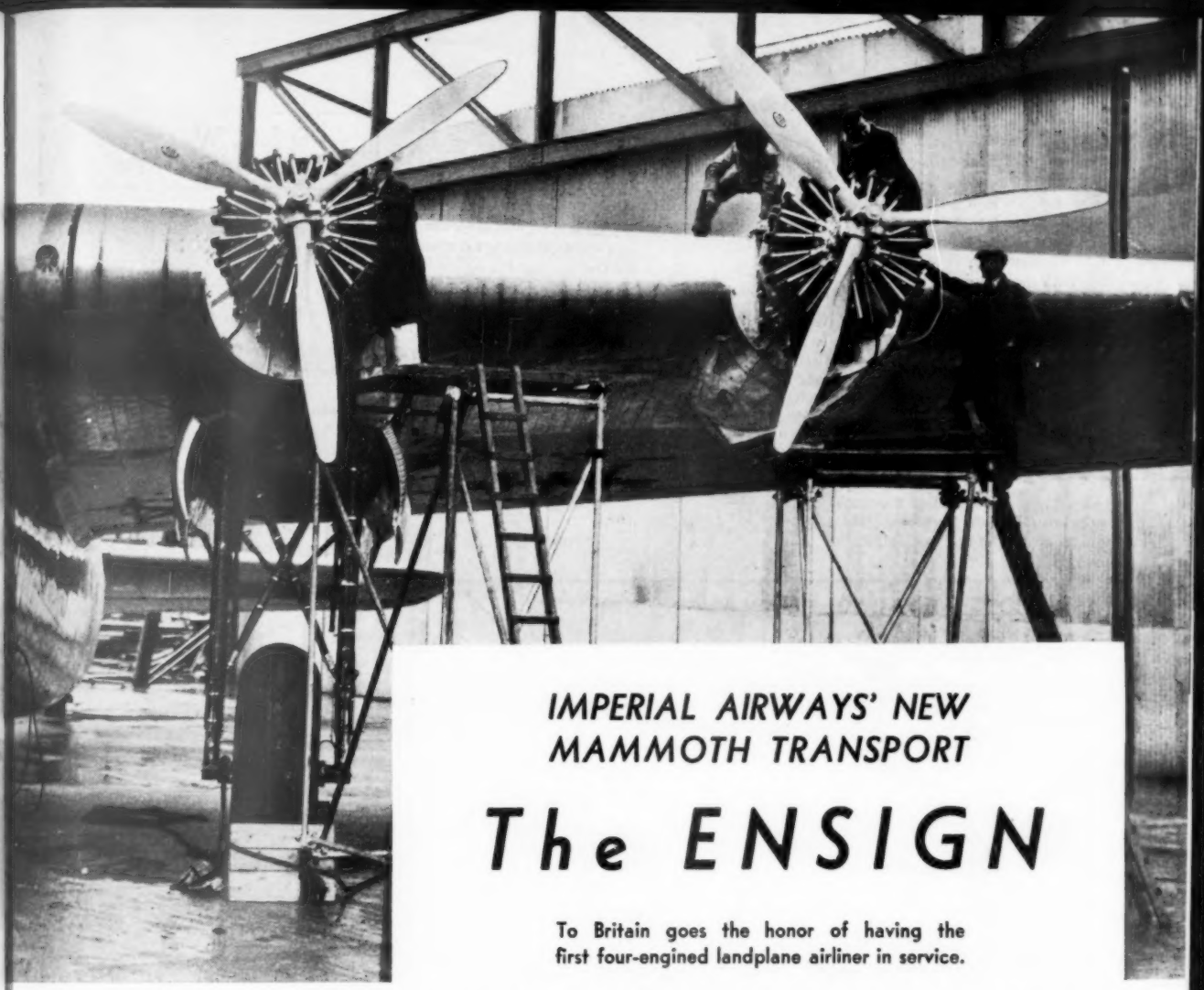
"Then I began to run through little flurries of snow. I didn't think much about it, though, because I was flying at 6,000 feet and still had plenty of ceiling. Anyway, there was no sense in turning back until after the next hourly weather report. I knew everything was good behind me so I kept on. Before I got as far as the Mississippi River she began to close in all of a sudden. The clouds kept on pushing me down and down until I got below 500 feet and decided I had better go up into it before I hit something. I had a damn good airplane for blind flying and the next weather report was due in a few minutes. Then I got to figuring how long it took me to get where I was when I went blind. The head wind had been picking up all the time. I didn't see how I could make Omaha on the gas I had unless I ran out of the storm pretty soon. But I figured that if the next weather report from Des Moines was good there was still plenty of time to get in there before the ceiling could close down. Then my radio went dead. Couldn't hear a thing.

"First time that ever happened to me. I kept on flying on my course while I made up my mind what to do. I decided I didn't have much chance of hitting Des Moines without the radio beam on account of the wind changing so fast there was no telling where I would end up. I knew I was getting somewhere close, but after a little of that blind flying without the radio I got kinda worried and decided it might be better to try to get back to Chicago than to go on through the storm. Seemed like it was getting thicker all the time. So I turned around and started back East.

"I hadn't been flying very long since I went blind, so I knew I ought to come out of it right away on the way back. But I didn't. The storm must have been moving in all along the line. That meant the wind had probably changed again and there was no telling where I was. I might be right on the course and I might be fifty miles off. On top of that, I found out I had already used up more than half my gas. I cussed myself out for ever getting into such a hell of a fix. Then I cussed the radio for going haywire just when I needed it. Never had one go bad before and never needed one so much before. I knew if I didn't come out into the clear pretty soon I wouldn't have time to locate myself when I did come out, and I would probably run out of gas before I could find a lighted airport. I began to worry so much I even forgot how cold I was.

"I figured I should have been back over Illinois somewhere by that time and I should have been out of the snow. But the damned stuff was thicker than ever; I couldn't hardly see the reflection of my wing lights. I knew the storm must have spread over East. I was getting pretty sick of everything by that time. You know how that blind flying wears you down. My gas was getting low and I didn't have a chance of getting to Des Moines or Chicago either one. So I started trying to climb up through it while I thought it over. I thought maybe I could come out on top and find a hole somewhere before I had to jump. At least I thought I would get up to where I could see the stars again and take my eyes off those damned instruments while I ran out of gas. I knew I was dumb as hell for getting into it, but it didn't help me out any to think about that. I climbed

(*Continued on page* 90)



IMPERIAL AIRWAYS' NEW MAMMOTH TRANSPORT

The ENSIGN

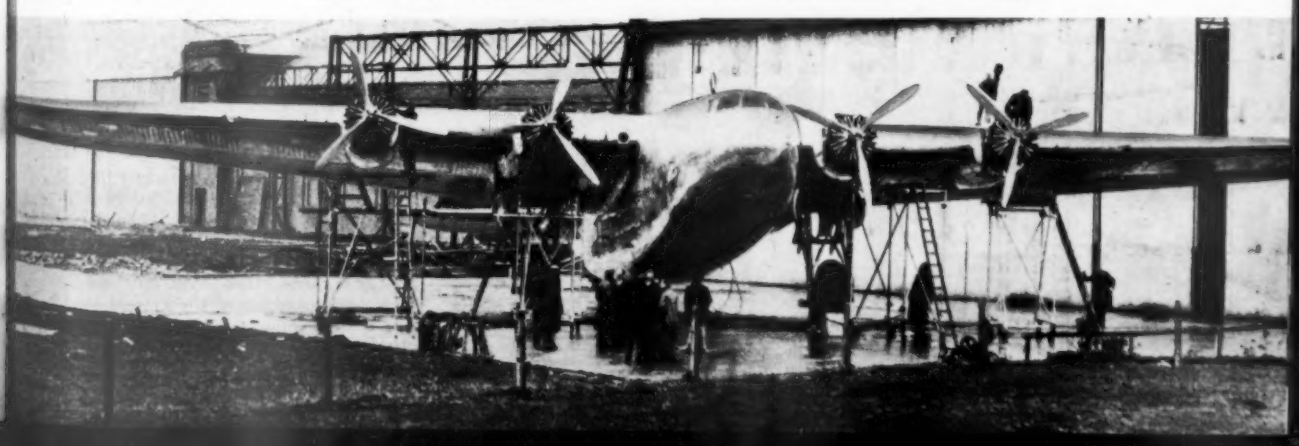
To Britain goes the honor of having the first four-engined landplane airliner in service.

BELATEDLY appearing on Britain's airlines is the giant Armstrong-Whitworth *Ensign* shown in detail on this and the following page. Had England not been wrapped up in turning out hundreds of warplanes like she is today, the *Ensign* could have been flying several months ago at least. But only now is the Armstrong-Whitworth concern (builders of Whitley bombers, etc.) enabled to turn a great deal of attention to this airliner.

Twelve *Ensigns* were bought by Imperial Airways on its original order more than a year ago. That airline has needed modern equipment on its European and Empire (to India, Australia) routes for several years. Unless the first *Ensign* falls far below expectations in its initial tests (which is extremely unlikely), Imperial Airways will at last have the modern equipment it has longed for. Because of the fact that Imperial is "the" official government-subsidized airline, that concern has been unable to withstand competition from airlines (both British and foreign) that have been able to buy modern airliners wherever they pleased. The majority of these modern ships that have given Imperial so much worry have been American-built Douglas and Lockheed airliners. The former are operated by KLM, the national Dutch airline; Czechoslovakian and Swiss airlines, while the latter are being used by British Airways, a smaller company, but nonetheless an Imperial competitor.

The Armstrong-Whitworth *Ensign* is an important addition to world aircraft construction. Inasmuch as first actual test flights are just getting under way as this is written, nothing is known of

Mechanics at the Armstrong-Whitworth plant are shown putting finishing touches on the huge new "Ensign". England's intense warplane program held up this ship several months.



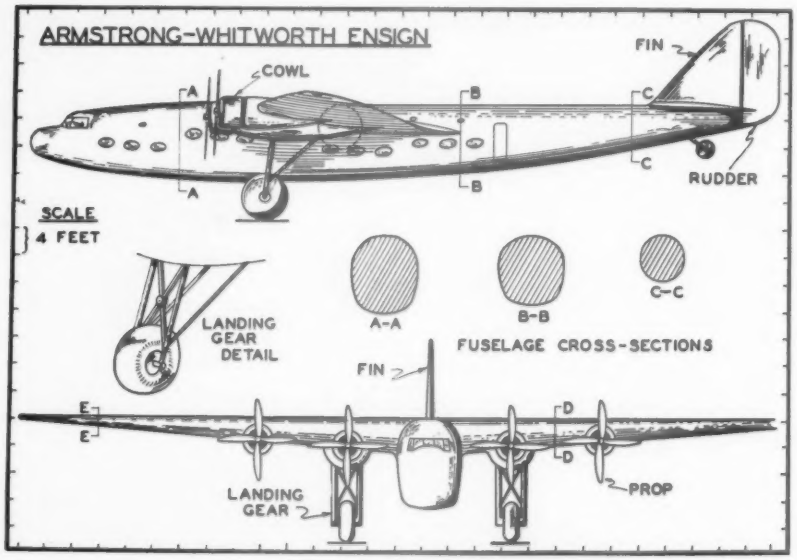
the ship's actual performance. It is known, however, that this airliner will far out-perform anything Imperial ever has used.

The *Ensign* is a palatial skyliner that has accommodations for 42 passengers when used in the "European" class. This class, incidentally, is comparable to the American day-plane. The Douglas DC-3, it will be remembered, carries 21 passengers as a day-plane, and up to 16 passengers as a sleeper. The "Empire" class of the *Ensign* is somewhat different from an American sleeper, however, for special provisions must be made for the very long run the ship must fly. Hence, this "Empire" adaptation of the *Ensign* will accommodate 27 passengers as a day-plane and 20 as a sleeper.

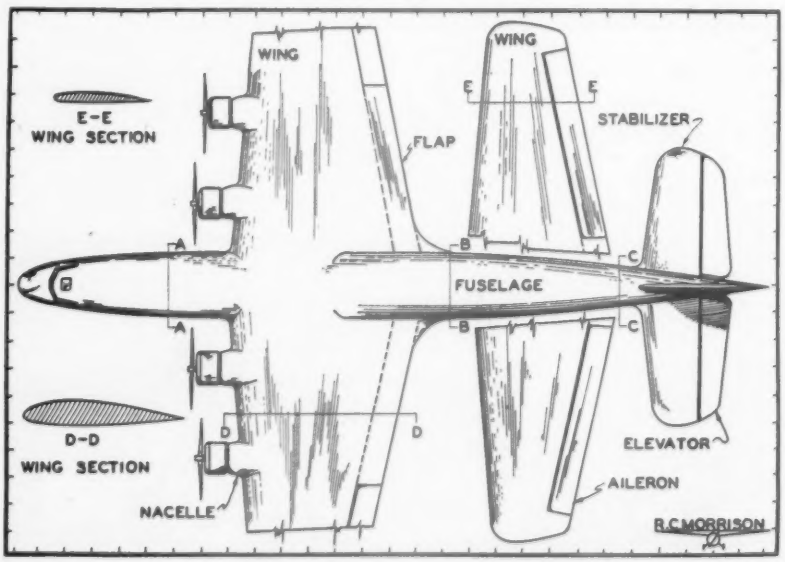
The *Ensign's* cockpit is much the same as the conventional airliner. Dual side-by-side controls are provided for pilot and co-pilot. A radio operator and two stewards complete the crew. The passenger-carrying part of the ship's fuselage is, in the "European" class, divided into four cabins. In the "Empire" version there are three cabins. In addition there is a small kitchen aboard where all meals are prepared by the stewards.

Technically speaking, the *Ensign* is a high-winged cantilever monoplane with a span of 123 ft., length of 110 ft., height of 23 ft. and wing area of 2,450 sq. ft. Power is supplied by four 795 h.p. Armstrong-Siddeley *Tigers* which are two-row 14-cylinder air-cooled engines. As the photographs on the preceding page show, the familiar American Hamilton controllable-pitch propellers are used. They are built in England by DeHavilland under license.

END



These drawings of the Armstrong-Whitworth "Ensign" were made from original plans. Four-bladed propellers will not be used.



D.S.C. War Aces
By Carl B. Ogilvie

Note: R—Residence at entry into service. B—Place of birth. G.O. No.—, W.D.—War Department general orders in which citation is published.

HAMILTON COOLIDGE

R—Miami, Fla. B.—Chestnut Hill, Mass. G. O. No. 37, W. D., 1919. Near Grand Pre, France. Oct. 27, 1918.

Captain, 94th Aero Squadron, Air Service.

Leading a protection patrol, he went to the assistance of two observation planes which were being attacked by six German machines. Observing this maneuver, the enemy sent up a terrific barrage from anti-aircraft guns on the ground. Disregarding the extreme danger, he dived straight into the barrage, and his plane was struck and sent down in flames.

Posthumously awarded, medal presented to father, J. R. Coolidge.

* * *

JESSE O. CREECH

R—Takoma Park, D. C. B.—Harlan, Ky. G. O. No. 19, W. D., 1926. Various dates and places in France, 1918.

First lieutenant, 148th Aero Squadron, Air Service.

Being on enemy patrol on Sept. 26, 1918, at Cambrai, France, when a large number of enemy airplanes were encountered, in the fight that ensued Lieutenant Creech shot down two of the enemy planes and saved the commander of our patrol from being shot down.

On Oct. 28, 1918, near Jenlain, France, Lieutenant Creech's flight of five planes was attacked by eight Fokker biplanes. In this encounter Lieutenant Creech also shot down two enemy planes.

On Sept. 28, 1918, south of Masnieres, France, Lieutenant Creech with his flight attacked an enemy balloon and compelled the observers to jump. Enemy troops were then attacked in close formation, causing many casualties and scattering all troops.

In all of these encounters Lieutenant Creech displayed high courage, great valor, and utter disregard of danger. He constantly went to the assistance of members of his flight and exposed himself with great fearlessness, and yet with all displayed keen judgment and tireless energy. He proved himself a leader of unusual ability, and was a constant inspiration to the members of his command.

JOHN O. DONALDSON

R—Washington, D. C. B.—North Dakota. G. O. No. 13, W. D., 1924. Various dates and places in France, 1918.

Second lieutenant, Air Service, U. S. Army, attached to 32nd Squadron, Royal Air Forces, British Expeditionary Forces.

* * *

For extraordinary heroism in action near Mont-Notre-Dame, France, on July 22, 1918, when, on patrol, he attacked a formation of 20 Fokker enemy biplanes. Singling out one of the hostile machines he engaged it from behind, firing a short burst at close range, the plane bursting into flames and crashing to the ground.

(*Continued on page* 84)

PUZZLE PHOTOS

WHAT IS UNUSUAL HERE?

WHAT SHIP IS THIS?

WHAT ARE THEY WORKING ON?

WHAT'S HE UP TO?

WE know that some of this paragraph is upside-down, so don't write in to tell us about it. That's just to keep you from peeking at the answer till you've given up trying to guess. So please be fair and don't peek.

The photo of the Beechcraft in flight is unusual because it recently flew 90 miles with that one engine dead. "That ship" is a rebuilt wartime Nieuport. "They are working on" a Boeing clipper's tail. "That man" is grounding static on a PAA clipper.

Between them, Viola Hart, Eulah Neff, Gweneth Nolan, Betty Foltz and Myrta Sawdey (left to right) have flown an aggregate of 1,500,000 miles as United Air Lines stewardesses. Last month they took their first boat ride by sailing from Frisco down through the Canal and up to New York.

Airplanes aren't fast to George E. T. Eyston. He's the fellow who drove an auto 311 m.p.h. recently in Utah. The TWAirliner was a little slow for him.

Personalities

Farmer W. W. Sheffield of Carthage, N. C. (left) fell off his ox cart and fractured his skull. He had been in the hospital almost three weeks when Pilot-Doctor F. M. Boldrige (right) was brought in. The latter had crashed his Ryan Sport while racing at 200 m.p.h. at an air meet. Nonetheless, Boldrige, who is president of the Carolina Aero Club, left in three days. Ox carts must be dangerous at that for Farmer Sheffield is still in bed.

Jack Knight made his last flight as a United pilot recently after 20 years and 2,400,000 miles of flying. Now United's "director of public education", Knight is a full-fledged groundling but gets a better salary.

A small but luring sum of money caused two of the three men in this picture to be suddenly crashed to a needless death last month. Rudy Kling, S. J. Wittman and Frank Haines (left to right) were racing at Miami when a sudden gust threw Kling's and Haines' ships to the earth.

Henry A. Burgess, prominent Los Angeles inventor, has perfected a parachute safety device that prevents premature opening during a jump.

The gentleman flying the above airplane is one of the meager few American notables who has been able to tell all-powerful U. S. newspapers to go to hell and make it stick. For his part he would be supremely content never to have the name Charles Augustus Lindbergh appear in print again. Last month he came home, but only because he had Pan American work to do. In New York only three days, he asked for bids for 100-passenger ocean-flying airliners.

Jacqueline Cochran recently flew a Seversky racer to a new world record, then asked newsmen to soft-pedal the fact that she is married to Floyd Odlum, millionaire New Yorker. Earlier this year Mrs. Odlum raced across the U.S. to win the check she is holding.

No frail lass is Showgirl Ursula Seiler, 22, who just won her LC license, bought and ably flies her own ship.

Col. Hubert Fauntleroy Julian, Harlem ace, promenades his flashy European wardrobe aboard the "Queen Mary".

How many recognize the distinguished looking gentleman in the bowler? He usually is seen in a uniform of sky-blue coat, high yella breeches and monogrammed cap. Because of this uniform, Roscoe Turner was once dubbed "Fancy Pants". The Colorful Colonel now works for Stearman-Hammond.

Letters

THE following letters are a very small part of the mail we have received following the publication of "They Said I Couldn't Fly" in the December issue. POPULAR AVIATION, *though long aware of Bureau of Air Commerce shortcomings, was little prepared for the flood of mail that followed the article. It will take us at least three issues to publish only the excerpts of important letters, each of them containing some new example of governmental bureaucracy.*

Stiff Hip . . .

Sirs:

I am considerably interested in "They Said I Couldn't Fly". My disability, however, is not my vision. The Department (Bureau of Air Commerce), by mail, informs me that my stiff left hip probably will trip me up.

This hip is a peculiar proposition. I gained it 17 years ago and have had it ever since. The Mayo Clinic operated and left the joint in a semi-sitting position. I can walk with no discomfort and practically no visible limp. The joint, however, does not move, so I cannot draw that leg back in a straight line. My ankle and knee, though, are quite all right. I have driven a car for years. I am 6 ft. 2 in. tall and have moved the seat back several inches to get my foot on the clutch pedal. The movement of the ankle and knee do the rest. I've driven a car some 150,000 miles from coast to coast—and do it well.

Recently a friend of mine got a new Waco and we did a bit of flying this summer. I found that, by running the seat back to the limit of its travel, I could get my foot on the rudder pedal and handle it with ease and facility. But alas, I found that most airplanes are made for little fellows. Seats are not adjustable because of the c.g. and pedals are not adjustable because they are already up against the firewall. Various mechanical contrivances suggested themselves to me for getting rid of the rudder pedal. I thought of squeeze-grip controls such as motorcycles use for hand brakes. But—the Department says there are no provisions made in the rules for planes with special controls.

The examining physician tells me I ought to forget it. "Flying is getting harder every day," he says, "brakes, extra controls. You won't want to fly a stick-and-rudder ship all the time, then you'll get in trouble."

What about the Hammond? Do they make special provisions for a special ship which doesn't even have the control which I might find awkward to use? I haven't written to find out yet.

R. H. WADE.

Kansas City, Mo.

Lack of regulatory provision for aircraft like the Stearman-Hammond was the basic reason behind "They Said I Couldn't Fly". Oddly enough, that particular airplane is ideally suited to Reader Wade. Only use for the pilot's feet is to operate brakes on the ground. All flying is done exclusively with the hands.—The Editors.

* * *

School Teacher . . .

Sirs:

Mr. Karant's grievance is so well put that I write to thank him and the editors of POPULAR AVIATION.

At the time the medical examiner relieved me of the $10 fee for the physical examination, he informed me that one eye was normal but the other was somewhat below requirements of the Bureau of Air Commerce. It was with extreme disappointment that I received a registered letter with a printed form (that in itself is the height of something) stating my permit was refused. I then determined to go to Washington, the idea being that a talk with the chief of the medical bureau would turn the trick.

". . . Goldang it, when the Republicans were 'in' federal licenses *meant* something!"

Meantime, I had been taking dual instruction from Lloyd Santmyer, a 2,400-hour pilot at Bettis airport, Pittsburgh. Each week I reported to Santmyer some new step I had taken in an effort to secure the permit. My efforts availing nothing, I set out for Washington armed with a recommendation from my instructor stating that he had given me five hours of dual instruction in a *Cub* and that I was doing quite well.

The chief of the medical bureau, a Dr. Adams, heard my plea with a courteous and attentive ear. I disliked, though, the manner in which he passed over the recommendation of the one man who really knew something of my case—Pilot Santmyer.

At the end of my twenty-minute interview I, somewhat in desperation, made a final effort: "Since," I told him, "men with transport licenses are being killed every day, certainly the death of a student pilot could mean little to the Bureau of Air Commerce. The airport officials at Pittsburgh thought I was qualified—else they would not have risked their plane—so therefore could I not be given a permit?"

Dr. Adams replied that I did not meet the requirements and that ended the interview.

Like Mr. Karant I do not favor the suspension of a physical examination. But—also like him—I believe a man's record should have some consideration. The fact that I had driven an automobile for 12 years with an average of 12,000 miles per year did not interest Dr. Adams. He said five hours of dual instruction meant nothing, though he admitted that a pilot with 500 hours might receive some consideration. The only way to get 500 hours that way would be to fly an unlicensed airplane, an act which in itself is punishable in Pennsylvania by heavy fine or imprisonment.

BENNETT M. RICH.

Rice's Landing, Pa.

* * *

"Nothing Would Stop Me" . .

Sirs:

I am sorry I cannot be perfectly frank and write under my own name. Perhaps, though, you will be interested in my experience with the medical examiner.

Until I was eight years old my eyes were crossed and I wore glasses until they were straightened out. But the muscles of my left eye had not kept pace with those of my right eye and for a long time I unconsciously let my left eye rest and the right do all the work. After five hours' instruction (in a Gipsy *Moth*) the owner of the plane became insistent that I take my physical and procure a license. For a week I worried and schemed.

I thought of memorizing the chart, but I got caught up on that once before so I was a little wary of getting by a Bureau of Air Commerce examiner with such a plan. I knew that if a ruse was detected I never would fly. Finally I decided on one method that was almost sure to work.

My younger brother closely resembles me in size, weight, color of eyes and hair. He took the physical in my name and secured the permit with no difficulty. It was wrong and I know it. But I am not sorry. I knew I would have been refused a permit and nothing was going to stop me from flying. Years of com-

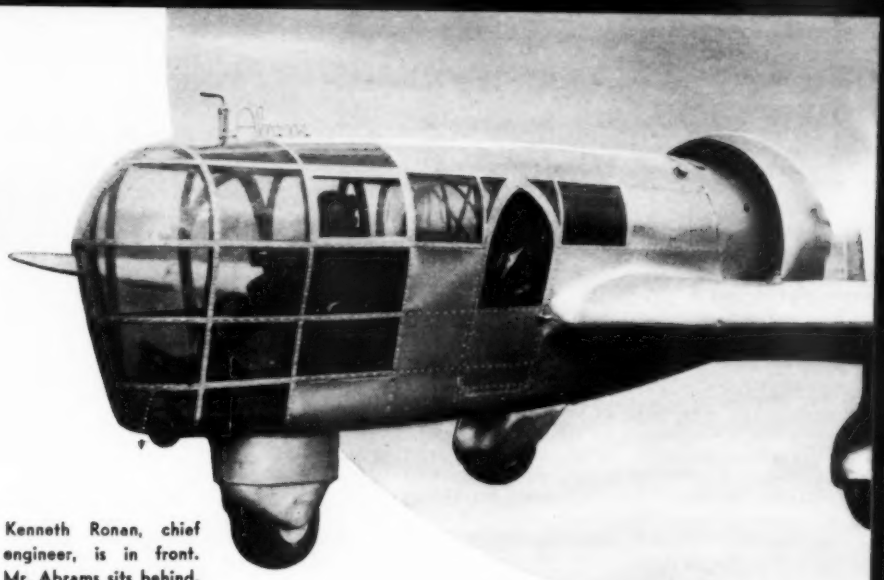
(*Concluded on page* 76)

AIR MAPPER

by JACK WARNER

Aviation Editor, Michigan State Journal

Here is the first airplane designed solely for mapping and photographic purposes.



Kenneth Ronan, chief engineer, is in front. Mr. Abrams sits behind.

THE rapidly growing industry of aerial mapping realized one of its greatest contributions recently when "The Explorer," the first plane to be built especially for aerial mapping, performed successfully on its initial test flight from Brooks Field, Marshall, Michigan.

A product of the newly-formed Abrams Air Craft Corp. of Lansing, Michigan, the new plane is a radical departure from conventional design. Many years of planning and ten months of actual construction were directed with one point in view: to create an airplane capable of more efficient and economical aerial mapping. The prerequisites of such a plane were considered to be perfect forward and downward visibility for the pilot, ability to ascend rapidly to high altitudes, high cruising speed, stability, at least an eight-hour fuel supply, supercharged engine, and arrangements for supplying oxygen to the photographic crew at high altitudes.

To gain these objectives, conventional types were reversed and the pilot's compartment was located in the front in a glass-enclosed gondola and the motor was put in the rear. This shift in design allows the pilot unlimited visibility to the ground, of utmost necessity if he is to do a precise job of location flying.

The "stratoplane" embodies many features of the first Wright brothers and Curtiss pusher planes. The principal features borrowed from these planes is the forward seating arrangement for the pilot, the pusher type motor, outriggers or booms for connecting the tail and control surfaces, and the three-wheel undercarriage for safety in landing. This undercrariage is a special feature, equipped with combination oil and spring hydraulic shock absorbers and Goodyear brakes. The undercarriage allows easy crosswind take-offs, prevents nosing over on landings and, with brakes on the rear wheels and a steerable swiveling front wheel, it is both safe and comfortable to taxi around on the ground at a high speed.

The plane is perfectly streamlined from nose to tail, even the engine being enclosed in the latest N. A. C. A. cowling. Streamlining of the latest metal-formed type is provided for undercarriage and wheels, and the outline curve which gives the nose a modernistic appearance is carried out in the struts, wing tips, rudder and wheel streamlining. The wings slope back and away from the gondola, allowing both the pilot and cameraman an unobstructed view of the ground in a turn. The wings, of full cantilever monospar steel tube construction, carry in their trailing edge not only the balance type of ailerons, but also special flaps which are partially lowered on the take-off to increase the lift of the wing and are fully lowered to act as a drag and reduce speed in landing.

The gondola is so close to the ground that no steps are needed to enter. One door is provided on each side, and they open directly to either the pilot's or cameraman's seat. Stick and rudder controls are available for both the pilot and cameraman, and can be separately or simultaneously operated by either. A full set of instruments and engine controls are within sight and reach of both pilot and cameraman.

An additional photographic feature is the door-within-a-door which allows the operator of the camera to sit in his regular seat and, without opening the main outer door, but by opening the inner door, take pictures at an oblique and forward angle. A special mapping porthole with a new type camera mount is built in the floor of the gondola, and pictures can be taken straight down through this hole. The aperture is hermetically sealed when

The lines of "The Explorer" closely follow those of current American "safety planes". Note tail design.

the camera is in place. Supercharging of the cabin is provided for by sealing in the glass which, beside serving as the windows, also serves as the outside covering of the gondola. In order that supercharging of the gondola could be accomplished as efficiently as possible, the overall space of the cabin was kept at a minimum. The first impression might be that the quarters were cramped, but closer inspection shows that there is adequate space for pilot, cameraman and all equipment.

"The Explorer" is in truth a utility plane. Every inch of its design shows careful planning with an eye to the use to which the plane would be put. Experience of many years in aerial mapping gave Talbert Abrams, president of the building concern, background for his ship. As president of the Abrams Aerial Survey corporation of Lansing, Michigan, he has sent many planes into far corners of the world — conventional planes with a few refinements installed by the Abrams company. They still fell far short of what he wanted. The rebuilt planes could not be flown to advantage for mapping work.

SPECIFICATIONS

	Areas
Wing	191 sq. ft.
Aileron	18.4 " "
Flap	12.74 " "
Stabilizer	20.7 " "
Elevator	9.8 " "
Fin	7.66 " "
Rudder	6.86 " "
	Weights
Gross	3200 lbs.
Empty	1790 "
Useful load	1410 "
Equipment	50 "
Gas and oil	800 "
Crew	380 "
	Performance
Maximum speed at sea level	185 m.p.h.
" " " 10,000 ft.	200 m.p.h.
Cruising speed (2,000 r.p.m.)	165 m.p.h.
Landing speed	66 m.p.h.
Rate of climb	1,800 f.p.m.
Service ceiling	21,000 feet
Cruising range	1,400 miles

Assembly of all data on requirements and design were secured by Talbert Abrams from the leading aerial survey operators in the United States and in many foreign countries. Tests and research were then carried on over an extended period with the aid of recognized aeronautical engineers, universities, and the National Advisory Committee for Aeronautics. Kenneth Ronan, consulting aeronautical engineer, graduate with the first class in aeronautical engineering from the University of Michigan, for some time associated with the National Advisory Committee for Aeronautics at Langley Field and later with the Glenn L. Martin company, and then chief engineer for the Stinson Aircraft Corporation, was chosen as chief engineer of the

(*Concluded on page 74*)

The MAN UNDER THE HOOD

By D. W. W.*

HERE'S some dope on Germany's secret new fighter—the Messerschmitt Bf 109—which set a new world's land plane speed record on Nov. 11, by flying 379 m.p.h. . . . The ship is built entirely of metal with slots along the leading edges of the wings and a flap along the trailing edge. . . . The landing wheels retract, being entirely enclosed within the wing surface. . . . The engine used in the record attempt was a Mercedes-Benz, normally rated at 1,000 h.p. for takeoff and 910 h.p. at 13,000 feet.

Slide rule calculations indicate about 1,900 h.p. was taken from this engine in making the record. The new fighters in their standard form are supposed to do 335 m.p.h. . . . Believe it or not they land, thanks to the slots and flaps, at 58 m.p.h.

* * *

And some inside information on the new Bell bi-motored fighter which was recently delivered to the U. S. Army air corps. . . . Those who were in on the Wright Field tests whisper that its top speed was 350 m.p.h. instead of the 300 which was published. . . . Furthermore, Engineer Bell is building a second ship in his Buffalo factory which is supposed to do at least 25 m.p.h. more than the No. 1 *Airacuda*. . . .

* * *

While we're on the subject of speed, look what's happening among the race boys. . . . Clayton Folkerts who built the racer *Toots* that was flown by both Harold Neuman and Rober Don Rae, and the highly successful *Pride of Lemont* in which Rudy Kling rode to triumph in the National Air Races at Cleveland — and to death at Miami a month ago—is building two more racers.

One will be flown by Joe Jacobson of Kansas City. . . . Clayton is still looking for another pilot to fly the second. . . . The new ships will be similar to Kling's plane with the same Menasco C6S 290 h.p. engine. . . . Clayton says he is sure he can get 20 m.p.h. more out of the new racers than the mere 315 credited to the Kling plane.

* * *

S. J. "Oshkosh" Wittman is planning on putting a C6S 290 h.p. Menasco into his little racer that now has a Menasco C4S 150 h.p. engine, for the coming season. He's been getting up to 240 m.p.h. out of the 150 h.p. installation. . . . He'll probably get about 300—if the airplane hangs together.

* * *

United Air Lines is in stewardess trouble again. . . . Four of the girls quit—so the story goes—because they were shocked by sights seen on some of the transcontinental sleeper flights. . . . They weren't able to keep the girl passengers out of the boy passengers' bunks, and vice versa.

This reminds us of Maj. "Shorty" Schroeder's old story. . . . The major, now a vice president of United, used to say that air transportation would never be a success until it was possible to make love at altitude. . . . The day is here.

* * *

Anybody notice that Transcontinental & Western Air has sent all its combination sleeper-club planes back to the factory to be changed definitely to all-sleepers or to all day seats? . . . They had a lot of complaints from passengers who bought berths on the combination ships. . . . Both men and women objected to strolling in dressing gowns from the berths to the wash rooms past a dozen stiffs of either sex sleeping, mouths open, in the chairs which were at the rear of the planes.

* * *

Now come the aviation engineers with calculations to prove that the Russian claim on the world distance record is a phony. . . . I mean the claims that they flew 6,305.7 miles from Moscow to San Jacinto, Calif. . . . The Russian plane—the ANT-25—took off weighing 24,885 pounds, of which 13,000 was fuel and 775 oil. . . . They used 594 h.p. for cruising or about 62.5 percent power and their engine consumed .47 pounds per h.p. hour. . . . This means they were drinking at least 274 pounds of fuel each hour of flight, and they claimed to have made the trip non-stop in 61 hours 7 minutes. . . . But plain arithmetic shows that they didn't have fuel for a flight longer than 47.2 hours. . . . In addition they claimed to have fought head winds the whole trip.

The engineers claim that the Russians must have landed at some one of their Arctic landing places, refueled their plane and then proceeded on to San Jacinto. What do you think? Remember it's easy to take care of a barograph if you have no conscience about that sort of thing. . . . And remember, too, that the good old Communist idea is that the end justifies the means. . . . The end, here, was great propaganda for the Communist air forces. . . . Personally I'd rather believe a slide rule than a Russian.

* * *

A reader — probably one of the seven who looked over our No. 1 attempt as a columnist—says he's deeply insulted by being told he ought to like the new air commerce regulations. . . . Says he's entitled to his own opinions, thinks the regulations are lousy, and that we are even worse. . . . The last thing readers ought to do is to cuss at a columnist because said columnist has the last word. . . . Anyway this gent—

(*Concluded on page 86*)

*The author is one of the best-informed aviation men in the country, withholding his identity in order to maintain complete freedom of comment. —The Editors.

Clipper Chicks

The fluffy little balls of down shown below are big business in air transportation. An airliner is their first earthly home.

By G. H. DACY

IT is nothing new for birds to take the air but when birds by the million take to the air in sumptuous modern Clipper ships and travel 6,000 miles or more on wings—but not their own—another tale of flying achievements is ripe for writing. Here it is.

Because a wise young man of aviation found the chicken tougher than sole leather in his air travels down one coast, up the other, and cross and crisscross of South America, he investigated the matter and determined that he had been trying to eat the sons and daughters of fighting cocks. Four centuries ago good breeds of poultry were introduced to the South American colonies from Portugal and Spain. Eggs and tender meat were plentiful in time; then the wealthy grandees seeking exciting sport introduced pit games—fighting cocks—worth their weight in gold. Eventually, cock fighting became the leading national sport south of the Rio Grande. Every native wanted to own a battling bird; commercial hens were mated with fighting cocks. That continued until the pit game breeds dominated the hennery business.

Why not a poultry revival for South America? the emissary of aviation asked himself. Crowers, layers and breeders brought by the skyways to revolutionize production; baby chicks by the million flying down to Rio.

A hatcheryman in Brownsville, Texas, listening to the fanciful plan of the Pan American Airways representative, sensed opportunity's knock at his door. He tried a test shipment of hatching eggs by air express to Guatemala; its success led him to develop a profitable export trade. Subsequently he shipped hatching eggs as far as Panama. However, egg delivery costs by air were high; trial shipments proved that baby chicks could be transported for one-half as much. The producer shifted to shipping chicks. Soon a new industry was outgrowing its swaddling clothes.

A Florida hatchery owner added the final finesse to the foreign marketing scheme by hatching the chicks in electric incubators according to airliner time schedules. There is a 72-hour period after incubation during which the younglings require neither feed nor water. By taking advantage of that grace period the exporter was able to reduce express costs one-fifth, as no feed had to be sent with the birds. He charted markets in the Caribbean area and South America which could be reached from Miami in from 70 to 71 flying hours. That poultryman now times his incubators whose capacity is 57,000 eggs every three weeks to vent their new hatches of chicks just in time for packing in cardboard "pullmans" and delivery by motor truck to the airport a few minutes before the airliner's departure.

(*Concluded on page 73*)

These newly-hatched chicks are destined for South American hatcheries.

Special air-travel compartments have been installed in the Clippers' tails.

TWO AIRMEN DARE ODDS AND——

Depression

Those gloomy days a few years ago floored many businesses. But Johnny and Kenny bought a ship . . .

Johnny Jurkofsky (left) and Kenny Bates (right) are Cubville's proprietors.

"Mascot"

THE other Sunday afternoon we were driving gloomily along Valley boulevard in Alhambra, California, when a small, wide-winged plane materialized out of nowhere, zoomed overhead so near to our open car that we inadvertently ducked, and made what might be called a landing. At least the plane came down.

The small ship side-slipped until it seemed to be landing backwards, straightened out with tremendous jerks of the tail, fish-tailed frantically, bounced on one wheel with the wing tip perilously near the runway and then, miraculously, was safe. Then, out of a cloud of dust, the ship taxied back up the field and with a desperately violent lurch or two, took off again.

We pulled off the highway and stopped, our gloom momentarily dispelled. Charlie and I had been out on a picture assignment, but the Chamber of Commerce must have been off-duty that afternoon because the much-vaunted California sun was conspicuous by its absence. We hadn't snapped a single picture.

"If that guy does that again," Charlie said, pointing to the little plane circling the field, "I think we've got something there."

So, cameras ready, we waited. The pilot circled the field again, came in over the runway with the smooth efficiency of a transport, and made a perfect three-point landing.

"Nuts," said Charlie. "I thought we were going to have a swell crack-up."

"Don't be so blood-thirsty. Besides, there's a swell sign over there. Let's see you make a salon shot of that."

The sign in question was a replica of a cub bear holding a placard on which was painted the words, "Entrance to Cubville." Beyond the sign was a makeshift building and a cluster of people gathered about a plane of the type we had watched make such a weird landing a few moments before.

"What's the matter with that guy?" I asked a bystander. "The one in that ship that just came in. Drunk?"

"Nah," was the reply. "He was making his first solo. Not bad, huh?". . .

Two years ago there were a couple of young fellows, holding average jobs with average depression salaries. Both were flyers. One held a transport pilot's ticket, beside an A and E mechanics license. The other had a private ducat, an idea, and a little capital.

Those two fellows, Johnny Jurkofsky, who had the idea and a few bucks, and Kenny Bates, the transport pilot, put the idea into effect. They leased a portion of the old TWA airport at Alhambra, built a runway and oiled it, and purchased a couple of ships. The idea was to start a school which would specialize in primary flight training. A school which would not only specialize in a solid foundation but would make the training so inexpensive that young fellows who had the desire but few pieces of folding money

Cubville's happy brood pose for Wick Evans, POPULAR AVIATION's man-behind-the-camera.

Exits thru the

By WICK EVANS

Pacific Coast Correspondent for POPULAR AVIATION

A little ingenuity resulted in this striking sign.

to back it up could learn to pilot a plane.

One of the first ships they purchased was a Taylor *Cub*. Hence the term, "Cubville." Since the first ship took off with Bates instructing the first student, there have been several hundred young men graduated from that school. Today there are several hundred enrollees, and a waiting list of another couple of hundred. As Johnny Jurkofsky said, "We can't handle all the kids who want to become flyers now because we don't have enough ships, but we'll have plenty more when we get 'em."

The boys have three *Cubs* and an open Travelaire now, and will have more in a short time if business remains good.

The first thing I asked Johnny concerned the weather. "Why don't you have trouble in the winter? I should think you'd have more students in the summer when there is no rain."

"That's where you're wrong," he replied. "Winter weather is better to train students than summer. In the summer the heat from the ground causes very bumpy flying conditions. In the winter it is almost perfect. We have more students in the winter than we have all summer long."

"Let's let Johnny—an even-tempered, smiling guy—tell you about the school himself.

"Well, our first idea in starting the school was for safety. That is why we bought the first *Cub*. You know that a *Cub* is supposed to be one of the safest ship in the air. It is practically impossible to have an accident in one, regardless of what goes wrong, barring, of course, something very unusual. Those little ships are so safe that it takes an experienced pilot to put one into a spin. You have to know how, that's all.

"Then, our premise in believing that we would make money out of a 'cut-rate' school was based on our belief that if we would give each student a course that was intimate, very personal; one that would make each enrollee feel that he was getting something besides a big class training course, we would be successful. We realized too—because we were of that class ourselves—that young fellows who had the ambition to become flyers were often hampered by lack of funds. It costs very little to operate a *Cub*, and so we dropped our prices so that our rates were within the reach of anyone who had even a modest salary.

"For approximately thirty-five dollars we will guarantee to solo a student. That includes a student permit which costs $10.00. After the solo, for $20.00 more, or five hours' solo, we guarantee an amateur license. And for a total of $140.00 we guarantee a private license. So far we haven't had a single failure. And we haven't had a single crack-up, either."

"Tell us something of your beginner's instruction," I asked.

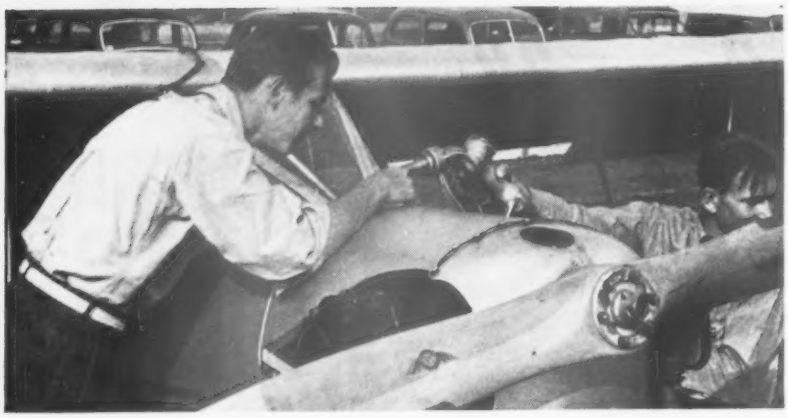
"Well, it sounds very simple, but it isn't as easy as it sounds. We teach straight and level flight, turns, shallow and steep, take-offs and landings. For more advanced students we teach all the emergency maneuvers, including vertical banks, side slips, spins and forced landing tests.

"Since time is money to us, we have a fool-proof timing system showing the amount of time each student spends in the air. We have a record with each student's picture on a board. As soon as that student passes certain requirements, his picture is placed on a different section of the board, showing exactly what progress he is making.

"Our log is controlled by an electrical clock, so that a student doesn't have to take our word for it, but can learn his standing by a glance at the board.

"When a student solos we give him a pair of gold wings and a daily log book. You might be interested to know that no student who ever won his wings with us

This Cubville student purchased his flying time on the piece-by-piece system and, soon after Evans shot this picture, exultantly soloed—successfully.



A Cubville ship no sooner gets back on the ground before it must be gassed up again and ready for the next student (who often must wait in line).

ever failed in any test he took in more advanced flying after leaving us. We keep the Travelaire for advanced students and Kenny can give advanced instrution so that a transport pilot's license is practically a cinch.

"We encourage kids to come to Cubville to look on and enjoy themselves, even if they don't take a course. We have a good time, and we like for others to enjoy themselves, too. Please don't think this conceited, but once we get a student, he generally brings in one or two more, and that's partly because we try to see that everyone has a good time."

"What type fellows are your students?"

"Mostly kids on small salaries, although we have everyone enrolled from a college professor to a messenger boy. Many of our boys are college students. They bring their parents out, take them for a ride in the *Cub* to show how safe it is, and usually manage to wangle a course out of a proud Dad. As a matter of fact, two or three dads have enrolled along with their sons—and daughters, for we have a number of girl students, too."

Johnny excused himself to take a couple of passengers for a ride in the Travelaire. Kenny Bates, who was snatching a smoke between students, told me more about their job. Because of his license he does most of the instructing, aside from keeping the ships in perfect order.

"I guess Johnny told you about everything," he said. Safety is the thing I'd like to stress most. And you might say that we adhere strictly to Department of

(*Concluded on page* 81)

Early Trans-Ocean Flying

TRANSOCEANIC flying is not a product of the Lindbergh era, although such is the belief of a great many people.

Away back in 1910 six men and a cat attempted to blaze the air trail from the United States to Europe and actually covered 1,008 miles over the sea—but not all of it in the direction of Europe.

The death of Walter Wellman in New York recalls that heroic first attempt to fly the Atlantic, which he commanded. Wellman was a newspaper man, an explorer, and an adventurer. When he conceived the idea of going to London by air everyone hooted at him. He stuck to his purpose, however, and procured an old dirigible that had been used for three years previously in exploration attempts in the Arctic.

The airship, which he christened *America*, had been constructed in Paris and the envelope was made out of a special fabric containing silk, cotton, and rubber. It was 230 feet long and had a capacity of 345,000 cubic feet of hydrogen. The frame was of wire-braced steel tubing. An unusual feature of the ship was the "equilibrator," a long, jointed chain of cans which trailed behind the airship in the water and acted as automatic ballast.

Two 80-horsepower engines, one mounted forward and the other aft, drove the ship through the air at a speed of from 20 to 25 miles per hour. She had an estimated cruising radius of 4,000 miles and the route chosen across the ocean was 3,500 miles—a narrow margin to allow for adverse winds. However, it was a dauntless crew that climbed into the narrow little airship car that Saturday morning, October 15, 1910, in Atlantic City.

Wellman, his whiskers dangling majestically, was master of the craft; Melvin Vaniman was chief engineer; F. Murray Simon had the important task of navigating; Jean Aubert and Albert Loud were the mechanics; and Jack Irwin was the wireless operator. Irwin's messages were the first radio signals to be sent from an airship. And to complete the crew, a kitten was taken along as mascot.

(*Concluded on page* 73)

Japanese Aviation

By N. Matsumara

At present, our aircraft industries, having made very rapid advance for several years, have nothing to fear in comparison with the advanced countries of Europe and America.

There are nine large aircraft manufactures: Aichi, Kawanishi, Kawasaki, Mitsubishi, Nakajima, Nippon Hikoki, Tachikawa, Tokyo Gas Denki, and Watanabe and also five motor makers: Aichi, Kawasaki, Mitsubishi, Nakajima and Tokyo Gas Denki in Nippon.

All of them are equipped with perfect machinery and modern plants and each has the production ability of more than twenty machines or engines per month. Those works mainly supplied large quantities of perfect powerful Military and Naval aircrafts for our Air Forces, but recently they have started to make several training or sport lightplanes or commercial planes for civil purpose.

Some time ago, our two civil flyers, Messrs. Iinuma and Tsukakoshi, successfully completed the Tokyo-London flight, piloting an all-homemade aircraft named KAMIKAZE-GO (Divine Wind-Vent-de-Dieu) which gave very satisfactory results.

The distance covered between the two cities is 15,357 kilometers and their time was 94 hours, 17 minutes and 56 seconds. Net flying hours 51 hours, 19 minutes and 23 seconds. Several famous French flyers failed on the way to Nippon but our airmen met with great success and established a new record between Nippon and Europe.

The previous Tokyo-Paris record is 6 days, 10 hours, 53 minutes established by Messrs. Costes and Le Brix, Breguet 19 and G.R. Biplane (Hispano Suiza 650 h.p.) on April 8-14, 1928—one of the examples for our present excellent technique and science of aviation. The machine used on this flight was a metal low-wing monoplane on which home materials and home accessories were used.

The Mitsubishi Aircraft Works, Nagoya, built this plane. Their trade-name is KARIGANE (Wild Goose) and is fitted with supercharged Nakajima—3 type 550 h.p. engine.

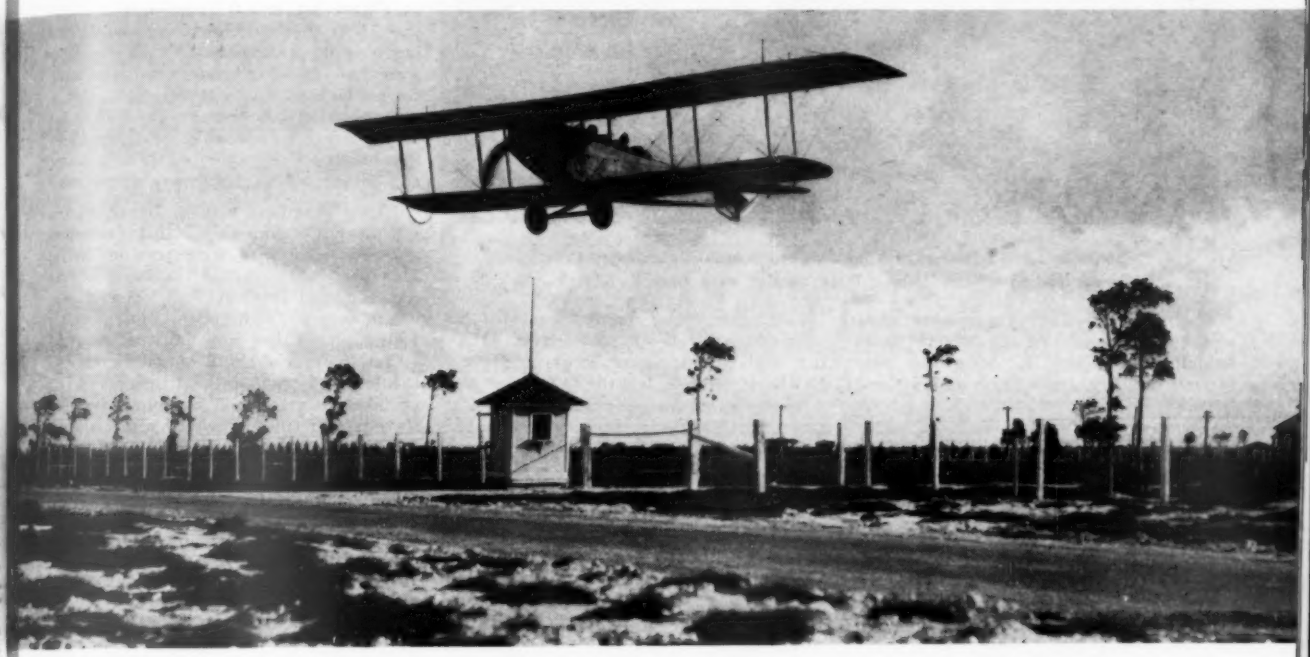
The span is 36′ 5″; length 24′ 2½″; height 9.′ The total weight, 4,400 lbs., maximum speed 300 m.p.h., and range is 1,400 miles.

Up to date, our airmen have had no activities to make any International Aviation Records, but will soon start on this way. A large all-metal super long-distance monoplane has been completed for this purpose which was designed by the Institute for Aeronautical Research, Tokyo Imperial University, and was built at Tokyo Gas Denki Works, Ohmori, near Tokyo, under the supervision of technical experts of all Nippon.

This plane is of a typical modern construction and prepared with an automatic pilot, fair streamline silver body and narrow long span scarlet wings.

(*Concluded on page* 85)

Old Jenny and Her Habits



At one time, this was the most familiar sight known to American airmen—a Jenny taking off.

Probably no airplane that has been before or since ever was discussed (and cussed) as much as that famous old trainer, the Jenny.

WHEN one of the newcomers to aviation wishes to heap the ultimate in criticism upon a plane, he compares it with a Jenny which, to his untutored and inexperienced mentality, was just about absolute zero in airplanes. Even some of the oldtimers, who really know better, have also slipped into this lamentable habit and refer to the venerable old windjammer with a sneer that should be pushed over on the other sides of their faces.

She, poor old lady, is their rough and ready measuring stick of everything aviatic from pursuit ships to bombers, although her creator, the late Glenn Curtiss, originally intended her as a primary trainer and nothing else. She was not a racer, admittedly, and was never intended for the purpose of hanging up records, yet this false idea is implied in all of the condemnations leveled at her by the present feather-headed readers of war fiction.

Jenny, more officially known as the Curtiss JN4, was the granddaughter of the Curtiss Type "R" and the daughter of the later Curtiss JN from which she derived part of her name. The old Model "R" was the first of the Curtiss tractors to appear with an automobile type hood, slashed with ventilating gills along the side, but which still held on to a pair of rudimentary skids. She was armed with a Curtiss OX eight-cylinder engine, also the first of a worthy line.

After some experience with the Model "R," improvements to this design were incorporated in the next of the series—the Model JN. The JN followed closely along the lines of the Model "R" even unto the gilled hood, the stiff dihedral and the ever familiar outlines of the tailgroup. First, there was the automobile type radiator which caused an epidemic of headaches among the radiator builders of that day, a propeller that proved more or less of a problem and a whole lot of miscellaneous items that required intensive development because of the extreme novelty of the ensemble.

There were more and more modifications made until we finally witness the

Here's the old girl in her prime—a maze of wires, and with her proud OX-5 held proudly in her nose. That old engine also made aviation history.

The pilots in this formation of Army Jennies are probably among the Air Corps' leading officers today. These Jennies were from Kelly Field.

JN2 which carried many refinements but which still maintained the original basic principles of Model "R" design. A little shaved off here and a little added there to the original JN was the story of the JN2. As might be imagined, the wing-sections went through many evolutions which embraced, at different times, the Eiffel-36, Curtiss-216, R. A. F.-6 and so on. But, all this she was gaining in performance—the desired performance of a training plane—and that was all that was necessary.

And now we will add a little bit by describing the engine improvements which begot engine Models OX-2 and OXX-2 as successors to the old OX. But, through all the minor detail changes the engine still remained an eight-cylinder "Vee" of characteristic design with the push-pull valve-gear, liquid cooling, sheet-metal jacketed cylinders and the ignition and lubrication system that found their way into the later models. The original OX was a 4"x5" bore-stroke rated at 90 h.p. while the OXX had a quarter inch added to the bore which gave the ten extra horsepower which was often sorely needed.

And now we arrive at the birth of "Jenny" or the Curtiss JN4 which was to continue faithfully through the duration of the war and for years after the war until she finally bumped her nose up against the Department of Commerce regulations in 1927. After that she became mostly a bootleg flyer which, taking her age into account, was perhaps just as well. And in her nose was the Curtiss OX-5 engine which was to outlive the ship by many years.

Later on, 'ole Jenny was to be equipped with all sorts of engines, Hissos, Hall-Scotts, Dusenbergs, and even LeRhone rotaries, but the OX-5 was the original and specially designed kicker for this ship. Hissos were very frequently used in order to improve her performance when taken out of the ranks as a trainer and used as an all-purpose plane to perform all sorts of special missions. When she carried a Hisso in her snoot she automatically became Curtiss JN4-H.

This last paragraph brings to mind the many varieties and models of Jennies that were produced for various purposes and at different periods. In order we had: JN4, JN4-A, JN4-B, JN4-C, JN4-D, etc., but probably the JN4-B is the most familiar to our readers because of its extended use at the various early training schools. The JN4-B was really Jenny as known to hundreds of thousands.

Being the leading training ship at a time when intensive primary training was paramount in the army, Jenny participated in many crack-ups which helped to give her a black eye. They soloed cadets hardly before the student knew what the wings were for, and the tremendous flocks of the machines, maneuvering over cramped fields in the hands of novices, hardly helped to give her a good reputation.

Literally, clouds of Jennies flew constantly over Kelly Field where mid-air collisions were common and where the mortality rate was high because of the congestion and indifferent training. And occasional attempts at stunt flying by raw cadets did not help to inspire public confidence in what was really an excellent training ship when operated under proper conditions.

Over in the English training camps they gave her a bad name because several JN4's stripped their wings while being looped, a maneuver for which they were not intended. Jenny, during wartime training, was not intended for a stunt ship, although she successfully survived severe acrobatics after the war in the hands of experienced pilots. Ask any of the old barnstormers about this.

Almost needless to say, Jenny was a 100-percent wood ship, fabric covered and provided with wire tension stays. Her principal structural weakness was the unstayed fuselage longerons in the vicinity of the front cockpit which, when Jenny struck her nose against an obstruction, cracked and spread apart so the forward part of the fuselage closed up like an accordion, crushing the unfortunate occupying the front cockpit. This was probably the cause of more deaths than all of the other faults combined.

After the war, and when the JN4's fell into private ownership, the forward cockpit members were reinforced by various methods that, in most cases, were successful.

There seems to be no accurate account of the number of Jennies actually produced for the government during the war, but they ran into the thousands. After the Armistice they were available at any place, in almost any quantity, and at almost any price starting at $50 and going up. In fact, such a great number of these planes were dumped on the market after the war that they proved a menace to the aeronautic industry and several hundreds were burned by Curtiss simply to get them off the market.

Conditions were such in 1919-1920 that a brand new Jenny, complete with crates and engine, in flying order, could be had for less than the necessary raw wood could be purchased for the construction of a new plane. Obviously, this proved to be an overwhelming obstacle to new plane sales and many of the smaller factories were forced out of business by the deluge of Jennies that came pouring out of government warehouses. The aviation world stood knee deep in a stream of Jennies and spare OX-5 engines and, to add to the post-war horrors, several hundred European orphans were also admitted into the country, including DeHavillands, Avros and similar European military training planes.

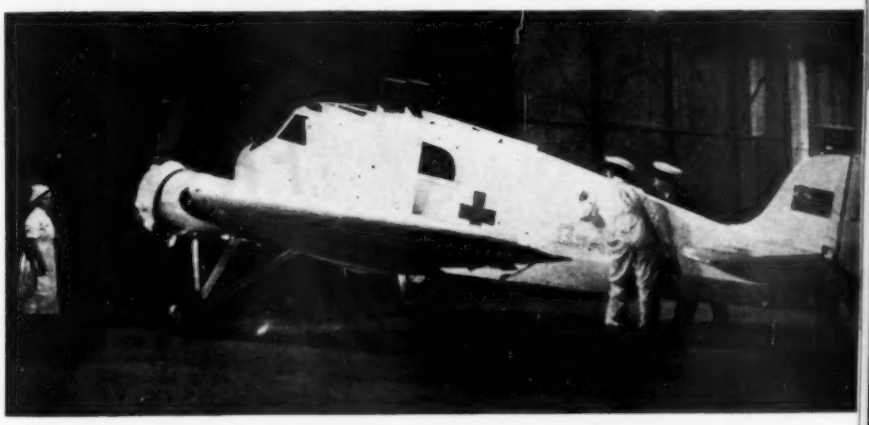
The only condition that kept the aviation industry from being completely sunk under the burden of post-war salvage equipment was the fact that there was an increased demand for planes by the returning ex-officers who became enamored of flying during the war and wished to continue in civil flying after the Armistice. These ex-army pilots developed all sorts of aviation projects ranging from simple passenger carrying

(*Concluded on page 78*)

When the war ended, hundreds of warplanes were lined up like this. In the above picture are Jennies (extreme left and right) and Thomas Morses.

GREAT BRITAIN INTRODUCES HER

FLYING AMBULANCE



Well-kept as the inside of a hospital, the twin-engined Monospar answers an emergency call. This mercy ship is aptly named "Florence Nightingale."

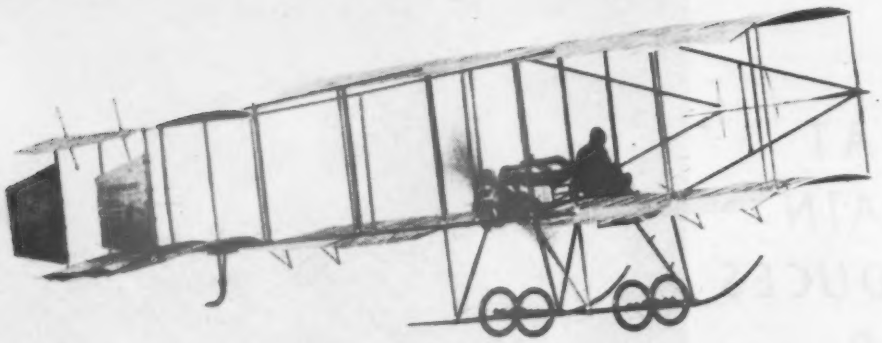
A DRONE high in the dark night sky becomes louder as a bright rectangular light flashes on and off. The man beside the bonfire stands up and waves. Another man, badly injured when a tree fell on him in that African wilderness, groans slightly as the descending airplane circles the clearing in which the two men wait. A few hours earlier the third member of their party had started a lonely trek through the wilderness to the nearest wireless station.

The circling ship slips in for a hurried landing and taxies rapidly up to the fire. The flames disclose the pure white form of a twin-engined low-wing monoplane. On the ship's wings and fuselage brilliant red crosses can be seen. On the nose, under the pilot's cockpit window, is the name *Florence Nightingale* . . .

A little more than a year ago the Surrey branch of the British Red Cross saw the need for and organized its now-famous air ambulance section. Not long afterward, that section received the trim, complete airplane shown on this page. Mrs. Amy Mollison christened the unusual ship with that historic name *Florence Nightingale*.

In turning out an airplane that would completely meet the requirements of the British Red Cross, the General Aircraft Co., Ltd., chose their standard Monospar ST-25 light transport as the general design best suited. Completely converted, the *Florence Nightingale* was the result. The ship was especially built to accommodate one stretcher patient, doctor, nurse and the pilot. A special doorway was built into the ship's side. The cabin was sound-proofed and controlled heating and ventilation provided. Elaborate equipment aboard included oxygen tent, blood-transfusion apparatus, ice containers, racks for medical stores, water tank, toilet, etc. Today the *Florence Nightingale* serves the Red Cross capably, is fully equipped with radio and night flying equipment for long distance emergency dashes.

Speeding to the scene of the emergency radio call, the efficient mercy-flyers prepare the injured man for the flight, lift him gently aboard, and fly him back to the hospital.



"Bristol"

FROM BOX-KITE

THE Bristol Aeroplane Company's works at Filton are the largest and most complete of their kind in the United Kingdom. Situated in one large area are the administration buildings, aircraft and engine factories, the airport and experimental hangar and the Bristol flying school. Extensive already, these have all been considerably enlarged in the past year due to Great Britain's new expansion program, in which Bristol is playing a leading part.

The story of Bristol's growth up to the present is in itself a review of British aviation. At the present time they are the largest producers of radial engines on the Continent and are also the builders of some of the world's fastest bombers now on order for the R.A.F.

The British and Colonial Aeroplane Company, as it was first known, was formed in February, 1910, by the late Sir George White, baronet, who had already made himself known as the "Tramway King" of the British Isles. In this field he had pioneered and out-thought competitors. He was to repeat this in aviation.

A man of remarkable foresight and vigor for his late years, he formed the concern as the first Limited company in Great Britain with adequate capital and workshops for the production of aircraft.

In those days, France was the hotbed of aviation activity and Sir George imported French designers, pilots and me-

BULLET was the first British fighter to be built in 1914.↑

FIGHTER was the famous Allied World Warrior back in '17.↓

↑SCOUT, built in 1916, fought in the War, flew 130 m.p.h.

↓BULLFINCH lumbered out of the Bristol factory in 1922.

This is the story of one of aviation's oldest, greatest names—Bristol. This country's manufacturers will do well to note the history of this famous British aircraft builder. Truly, the Bristol example is an impressive one.

E TO BLENHEIM

By ERWIN J. BULBAN

chanics to help him. After the first type was produced, Sir George figured that the way to make it popular would be to have some responsible authorities use it. He persuaded the Army officials to try the machine at the next Army maneuvers, to be held at Salisbury Plain that June. By doing this, Bristol airplanes became the first to fly at Army maneuvers—considered a very important affair.

The plane used was the *Box-Kite* (Gnome rotary engine of 50 h.p.) fitted with a pusher prop which gave a maximum speed of 37 m.p.h. and a range of 50 miles! The framework was of ash and spruce covered with a cotton fabric and there was provision for three persons. Several *Box-Kites* were flying in India and Australia as early as 1910.

Results of this plan were not slow in coming. Soon after, the Russian Imperial government placed an order for eight of these machines. This was the first government contract ever placed for British aircraft. Then, in 1911, the British government, sensing the possibilities of aircraft, also purchased some *Box-Kites*, marking the beginning of the Royal Air Force as it is today. *Box-Kites* were the standard British military aircraft up to the outbreak of the War in 1914.

Meanwhile, Sir George was laying more plans, gathering more men about him and expanding facilities. Previously, in 1910, he had established the first Bristol flying schools, another wise move. The War broke; more than 80 per cent of the pilots at the beginning were Bristol-trained.

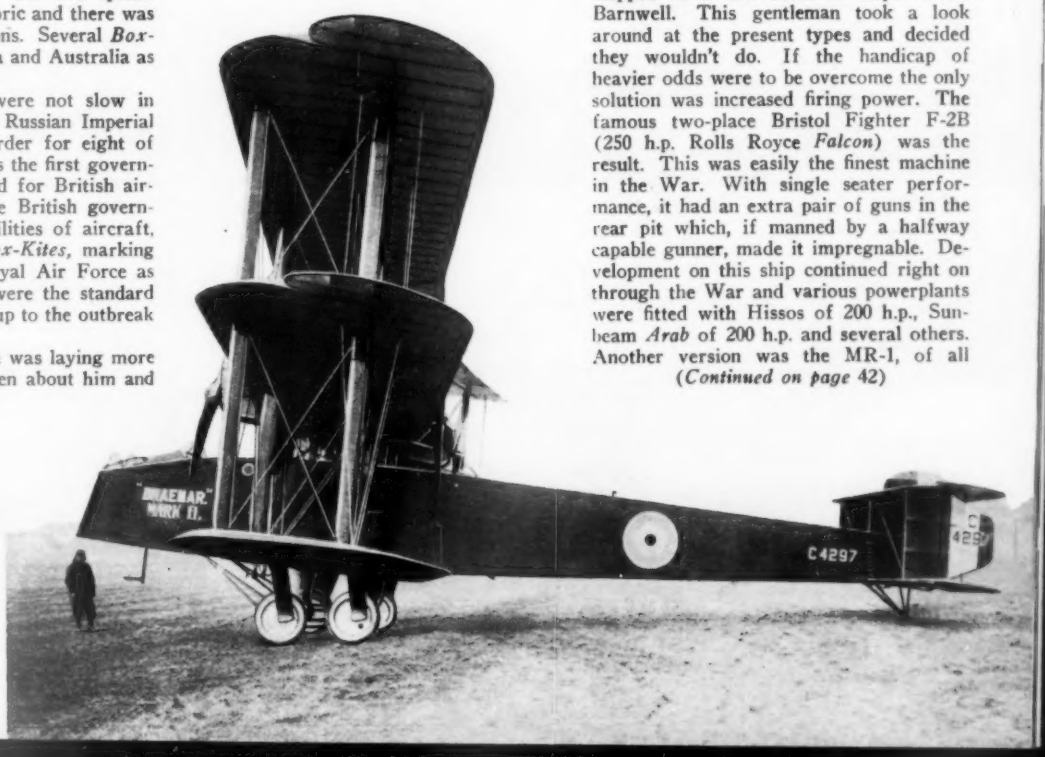
Luckily production had already begun on the *Scout D* (80 h.p. Le Rhone), better known as the *Bullet*. This was a single-place biplane resembling the Sopwith *Pup* that came out some years later. Late in the War, the *Scout F-1* (200 h.p. Sunbeam *Arab*), an advanced fighter of notable performance, made its appearance. Also fitted with a Cosmos *Mercury* of 315 h.p., it was similar to the "D" but was heavier and better developed.

The *Monoplane* was the next design. This was a one place monoplane fighter (Le Rhone rotary of 110 h.p.) chiefly employed on the Eastern front against the Turks. It had a top speed of 117 m.p.h. at 10,000 ft. and 130 m.p.h. at sea level.

The War progressed further than anyone had expected. The demand for aircraft far exceeded the supply, and by 1917 the Germans had gotten control of the air because of better equipment—and lots of it.

At this disastrous moment Bristol again stepped in in the form of Capt. Frank Barnwell. This gentleman took a look around at the present types and decided they wouldn't do. If the handicap of heavier odds were to be overcome the only solution was increased firing power. The famous two-place Bristol Fighter F-2B (250 h.p. Rolls Royce *Falcon*) was the result. This was easily the finest machine in the War. With single seater performance, it had an extra pair of guns in the rear pit which, if manned by a halfway capable gunner, made it impregnable. Development on this ship continued right on through the War and various powerplants were fitted with Hissos of 200 h.p., Sunbeam *Arab* of 200 h.p. and several others. Another version was the MR-1, of all

(*Continued on page* 42)



BRAEMAR, completed with the Armistice, was to have dumped bombs on Berlin.

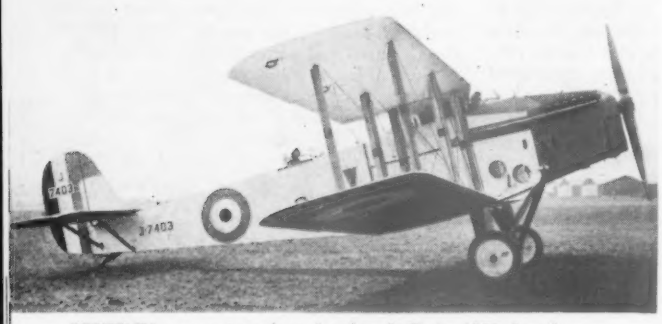
THE STORY OF 1922-1927 BRISTOL AIRCRAFT

BRANDON was built in 1922 as an ambulance version of Bristol's Type 62. Note stepladder to pilot's cockpit.

THE RACER, another 1922 design, was something of a forecast. Note monocoque fuselage and retractable chassis.

BROWNIE was Bristol's first attempt at lightplane design. This ship won many prizes for light aircraft in 1923-24.

BLOODHOUND, produced in 1923, looked something like its namesake. The staggered sweepback was an innovation.



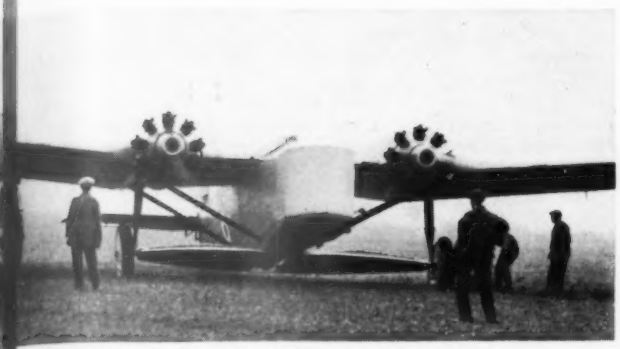
BERKELEY was a two-place bomber built in 1925 for the Air Ministry. The engine is a Rolls-Royce "Condor".

BADMINTON, produced in 1926, was appropriately named. This fighter was the forerunner of the famed "Bulldog".

BULLDOG came out in 1927, was for many years the standard R.A.F. fighter. Above is the two-place version.

BULLPUP was Bristol's other 1927 fighter design. This was an early high-performance interceptor fighter.

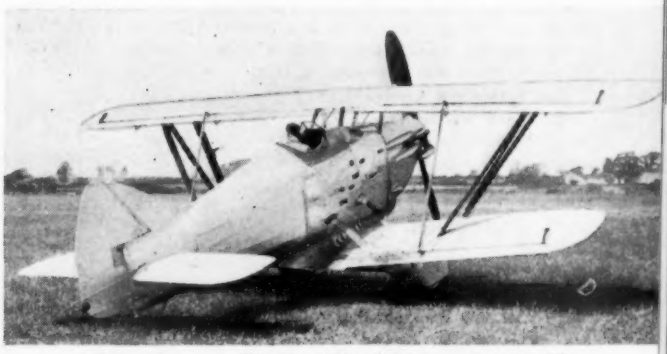
THE STORY OF 1927-1937 BRISTOL AIRCRAFT



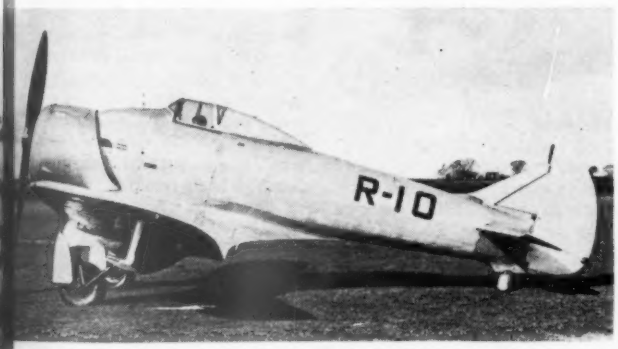
BAGSHOT was the 1927 forerunner of present Bristol twin-engined bombers. Note resemblance to "Bombay".

TYPE 110 was produced in 1929 as a commercial cabin biplane. This ship used either a five- or seven-cylinder motor.

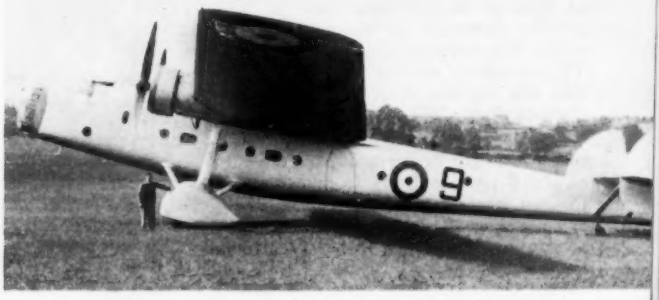
TYPE 120 was Bristol's first military plane with a "greenhouse" for the gunner. This was produced in 1932.



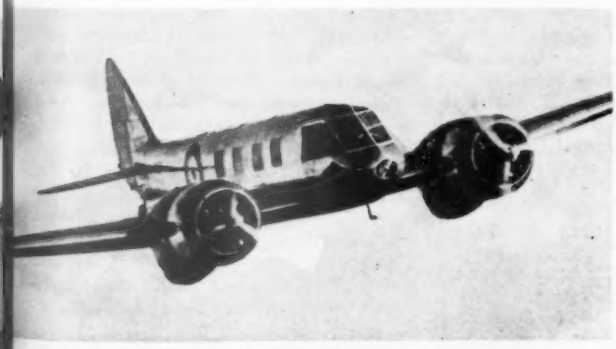
TYPE 123 was Bristol's 1934 fighter, powered with a Rolls-Royce "Goshawk". Not many of these were flown.



TYPE 133 also came out in 1934, looked promising, but got nowhere. Note resemblance to Seversky P-35.



BOMBAY is a 1935 design still used by the R.A.F. as a bomber-transport. This can carry 24 armed soldiers.



BRITAIN FIRST, built in 1935 for Lord Rothermere, was directly responsible for the "Blenheim" on page 39.

TYPE 138A set the world altitude record in 1936, broke it again last year. This ship climbed to 53,937 feet.

The Story of Bristol

(*Continued from page 39*)

metal construction. The fuselage was covered with a smooth metal skin that gave it a beautiful, modern appearance. The metal wings had been made by Gloster. However, through difficulties caused by lack of time and material this ship never went into production.

The F2-B was the machine that started the higher-ups thinking about the two-seater as regular fighting equipment. Today this type is found in every up-to-date air service.

Demands for the fighter grew so large that they had to be built under sub-contract by non-aircraft firms. The United States tried to produce them but it couldn't take the Liberty engine installation. Later the U. S. Air Corps turned it out as a bomber designated the XB-1 fitted with a Wright-Hispano, but it was outmoded by then.

Just before the Armistice, the Bristol *Braemar* triplane bomber (four 400 h.p. Liberties) appeared with a top speed of 130 m.p.h. The War ended and this type like many others in the same circumstances, sank into oblivion.

In 1920 an event occurred that was to change the whole history of the Bristol company and also have its effect on British aviation. During 1914-1918, Roy Fedden was working with Brazil-Straker, an important motor-car concern which had started to produce several types of radial air cooled engines under the name of the Cosmos Aero Engineering Company. The most likely series of the lot was the *Jupiter*, supposed to produce about 250 h.p.

Enter Sir George White. With his peculiar foresight he persuaded the directors of the Bristol company to take over the Cosmos interests, so as to enable Bristol to build their own aircraft engines. Again he was justified. When Roy Fedden found himself in a properly equipped shop and backed by Bristol finance, he was not long in turning out a good engine. The *Jupiter*, at last perfected, was the first result. The reliability of this engine soon became well known and many countries (France [Le Rhone] being the first) acquired the rights to build the *Jupiter*. Later, licenses were also granted to Canada, Germany, Italy, Belgium, Czechoslovakia, Jugoslavia, Portugal, Switzerland, Hungary, Spain, Poland, Japan and the United States—the latter being built by the E. W. Bliss Company of Brooklyn, N. Y.

In the United States it passed both the Navy and Department of Commerce tests with honors. In Great Britain it was installed in a large number of military and commercial aircraft.

In 1922 the Bristol people produced several very interesting aircraft. The most advanced of these was the *Racer* (400 h.p. *Jupiter*). This was a single place monoplane of monocoque construction fitted with a fulled cowled engine *and retractable landing gear*. It was the result of hundreds of hours in the company's wind tunnel but due to its unusual characteristics it was treated as a freak and forgotten.

The next type was the *Ten-Seater* (400 h.p. *Jupiter*), a cabin biplane with accommodations for eight passengers, a crew of two. The cabin was heated and equipped with wireless. Later it was adopted by the R.A.F. as an ambulance plane and designated the *Brandon*.

A modified version of the 1917 fighter was also made. This was known as the *Jupiter Fighter*, being fitted with a 400 h.p. *Jupiter*. With this improved power plant it naturally had a higher performance than its ancestor, but the authorities were quite satisfied with the present equipment and it wasn't accepted.

Designed to compare with a high-priced motor car, the *Taxiplane* was another 1923 product. A three-place biplane fitted with sliding hatches for use in bad weather, it had a fuel consumption of about 15 miles to the gallon. This was one of the first serious attempts to make the airplane a common private way of traveling.

"My business sure was awful until I painted that sign on the fence. . . ."

In 1924 the *Lucifer* school trainer (100 h.p. *Lucifer*) was produced for use at the Bristol flying school. This was conventional biplane with very safe flying characteristics. It was very popular at the time and was adopted by several foreign governments for training.

1925 was a very bad year for the British aircraft industry and there was a lack of demand for aircraft in the high-powered class. To overcome this Bristol turned temporarily to lightplanes. The first attempt was the *Brownie* fitted with a Bristol *Cherub* two-cylinder opposed engine. Two of these were actually made and entered in an Air Ministry competition for lightplanes. One was fitted with a metal wing and won second prize. It had a speed range of 36-70 m.p.h.

In 1926 Bristol tried to make up for the past slump and produced four new designs. One of these was the "99" or *Badminton*, a single-seater biplane racer embodying many characteristics of the wartime Bristol *Bullet*. However, several refinements were easily discernible. The fuselage was faired into the top wing and streamlines were placed over each cylinder. A larger spinner completed the already sleek appearance.

Still another version of the 1917 fighter was produced. Known as the *Boarhound* (425/450 h.p. *Jupiter VI*), the main difference was the smaller lower wings. It was designed as an army co-operation machine. Due to its high performance a number of these were purchased by the Mexican Air Force.

A new field was entered with the *Berkeley* high-altitude bomber. Fitted with a Rolls Royce *Condor* III engine of 650 h.p., it was never put into service, due to most likely, the lack of high-altitude equipment for the crew. But it demonstrated that Bristol engineers had anticipated the tend of today.

Another interesting type was the *Bullfinch* (400 h.p. *Jupiter*), a single-place high-wing monoplane fighter. Unusual features included the odd shape of the wings, each a separate cantilever and the twin tail skids. This ship was the first military monoplane built by Bristol since the 1915 monoplane scout.

The next ship was the *Bagshot* (two *Mercuries*). This was a monoplane bomber of modern appearance and is really the ancestor of the new *Pegasus*-powered *Bombay* bomber-transport.

Year after year the Air Ministry had seemingly neglected the purchase of new aircraft for the Royal Air Force even though many worthy new types in every class made their appearance steadily hoping for acceptance. Then officials actually realized that most of the "air defense" of Great Britain was composed of obsolete equipment that had been retained in service long after the War. An outstanding example of this is shown by the fact that the last 1917 Bristol twin-place fighter was not replaced until 1932! Of course it was not holding a highly important post but many fighters were retained up to 1928.

An Air Ministry fighter competition was held in 1927 for the purpose of supplying a new fighter for Britain's air defense. Out of 11 types submitted, the *Bulldog*, designed by Capt. Frank Barnwell, walked away with first place. Of all metal construction, it had been designed with utmost consideration for good maneuverability, high speed and easy maintenance. As a result of the outcome the Air Ministry ordered a large number of *Bulldogs* and they became the standard fighter for the R.A.F., a position which they held for several years. After it had been released for export, numerous foreign governments placed important orders for this machine while others obtained the license to build this high performance fighter.

In the same year, the Bristol *Beaver* (485 h.p. *Jupiter*), also known as the 93-A,

(*Continued on page 72*)

Britain's BRISTOL "BOMBAY" Bomber

He Built The "Airacuda"

By GEORGE E. TOLES

This is the story of the man behind the airplane on the opposite page. Larry Bell has given the military world a warplane it is discussing in whispers.

LAWRENCE D. BELL, president of the Bell Aircraft Corporation of Buffalo, has cut a niche for himself in aviation's hall of fame and, at 43, is one of the country's outstanding personalities in the business of making planes.

His *Airacuda*, now completing phenomenal tests at Dayton, Ohio, is Larry's masterpiece. The multi-seated fighter of pusher type with twin engines is being hailed as the outstanding military aircraft developed since the World War. Its effectiveness against bombers is sending the military aircraft stock of Uncle Sam soaring in the world market.

There's a colorful story behind Larry Bell and the way he built up his Buffalo company with only a few ideas and plenty of initiative to start with. When Consolidated Aircraft announced in the summer of 1935 it was going to pull up stakes in Buffalo and go to California, Bell was asked to go.

But Larry had plans for Buffalo as an aircraft center and the man who had been salesman and a principal driving force in the Consolidated Company decided to keep his base of operations right there in the Queen City. He resigned his post as vice-president and general manager of Consolidated and started out on his own hook.

Looking back on Larry's 43 years of existence, one finds he is essentially an opportunist. Born in Mentone, Ind., a town that you won't find on many maps. Ninth child in his family, he really had two strikes on him before he got up to bat.

The Bell family moved to Santa Monica, Cal., when Larry was 13 and he entered the Polytechnic high school there. During vacations and on Saturdays he worked in a hardware store for $6 a week. When Larry graduated from Polytechnic in 1912, his brother Grover, 10 years older, bought a Martin biplane and learned to fly.

Then Larry got a job as mechanic for Lincoln Beachey, who he describes as "the greatest flyer the world ever produced." Thus, at the age of 18, he already was laying a foundation for himself in the industry which he wanted to make his life's work. But in those early years he had no idea that his *Airacuda* ("tiger of the sky") would appear in the next quarter century, the most potent weapon of defense known to military science.

There was a time when he left it, heartsick and discouraged. That was after his brother had crashed to his death in 1913 at a Fourth of July exhibition at Petaluma, Cal., and Beachey, the first pilot to do death dives and upside down flying in the

Lawrence D. Bell

United States, had thundered to his death a year later at the San Francisco World's Fair.

But it wasn't long before he was back in the fight again, the call of his first love too strong to be overshadowed by sentiment. He began working as a helper in the factory of the Glenn L. Martin Co. in Los Angeles for $12 a week. When the Martin factory moved to Cleveland in 1917, Larry Bell was an important figure in the company. He went in advance of Martin and built the new plant.

In 1925 he had been made vice president and general manager of the Martin firm. He resigned this position to take a crack at a new mechanical field, automatic machinery. Three years later he came East for the company and stopped off at Buffalo.

Here he was met by an attractive offer. Promoters of a new airplane firm, then in its formative stages, asked him to became president. But he didn't like the looks of the offer and passed it up. Calling on Major Reuben Fleet to whom he had sold Martin planes in former years, Larry sold the major on the idea that he would make an excellent sales manager for Consolidated Aircraft Corp. of Buffalo.

The following year he was named vice president and general manager. Larry's next opportunity came when the major decided to pull up stakes in Buffalo and move his entire plant and equipment to the Pacific coast where he could deliver his military planes with greater facility to U. S. plane bases.

The major left a modern, fully equipped factory in Buffalo with hundreds of skilled workmen who preferred to keep their homes here to moving out to the coast and beginning over again in a strange environment. So Bell rallied Buffalo capital and Buffalo labor around him to keep the remnants of an important industry in the Queen City.

The new Bell Aircraft Corp. was incorporated a month before Consolidated moved. Buffalo capitalists subscribed $500,000 and a similar amount was raised through another stock flotation a year later.

Often months go by with no news as to what is being done at the Bell plant. But hundreds of men are at work and Ray Whitman, vice president, and Designer Robert Woods are in there hitting the ball along with their aggressive president.

So the aircraft world was startled earlier this year when Larry trotted out the *Airacuda*, a plane that dropped the jaw of the war lords of Europe and the east. The XFM-1, as it is technically known, was surrounded by mystery until Larry decided to let the public know what it was all about.

It's a fighter that sallies forth to knock bombers off the map, the only plane that ever carried a cannon. It carries two, accurate for two miles' distance. It's faster than any bomber, can make 300 m.p.h. if necessary, according to inside reports.

It can go hundreds of miles out to sea or along the coast to find its prey and strike. Bell not only built it in competition with other companies but Larry and his associates hatched the idea from a fundamental need and brought the advantages of the new type to the attention of the War Department.

Larry's black eyes gleam when he talks of his *Airacuda*, named after the barracuda, tiger fish. And the prize all belongs to Uncle Sam. No other nation can buy one. The 900 men who built her were sworn to secrecy under the espionage act. Not a ship for war but for defense, says Bell.

"Too long our designers have worked at bombers," he says. "The result is that cities along the seacoast would have been helpless in the event of an attack by air. We had nothing capable of staving them off. We saw the need, conceived the plans, presented the idea, then built the ship."

Yes, Larry Bell's name will go down in aviation history as a man who made a great effort to make this a safer country for Americans. END

BELL "AIRACUDA"

"Cub" for Can "Delt

This Export

By MORTON B. KELMAN

No country on earth is so remote that American aircraft have not operated there. Here is the story of Yankee aviation salesmanship abroad.

WHILE undertaking a world tour by air one easily perceives that almost without exception foreign airlines utilize American-built aircraft and aircraft engines. Only of late have these foreign airlines recognized the efficiency of transport planes that have been constructed in the United States. Foreign interest was stimulated when several major European airways imported a number of American-manufactured transport planes to fly their routes.

Passenger planes of European design and manufacture were not purchased by the Continental importers owing to the fact that no such types of craft were available over there due to the concentration of the aircraft industry on the development and construction of military aircraft.

The export of passenger planes has risen tremendously since the first American transport was shipped overseas. Hardly a week has passed within the last year that at least one transport plane has not been exported for use on airlines overseas. Today the United States possesses the distinction of exporting the greatest number of passenger planes in the world.

Aircraft produced by the Douglas Aircraft Company has greatly aided the United States in obtaining its eminence in the export field. The Douglas DC-2 and DC-3 airliners are flown the world over, being used by airlines in Austria, Alaska, China, Czechoslavakia, Belgium, Poland, Holland, Spain, Russia, Switzerland, Sweden and Japan. The latter has secured the rights to construct the DC-2. The 14-passenger DC-2 and 24-passenger DC-3 are not the only commercial products exported by the Douglas company. Several 32-place Douglas DF flying boats have been built for Japan and the Soviet. Many of the new four-engined DC-4 skyliners will also fly foreign air routes in the near future, as foreign importers are always on the lookout for things bigger and better.

The Lockheed Aircraft Corporation is another large exporter of passenger craft, having shipped many 10-place *Electra* transports to Alaska, Argentine, Canada, Australia, Brazil, Cuba, Jugoslavia, Great Britain, Sweden, Roumania, Venezuela, New Guinea, Poland, Mexico and New Zealand. Lockhead has also received orders from the Royal Dutch Airlines (KLM) and the newly organized Trans-Canadian Air Line for a total of ten new Lockheed "14" skyliners. Six of these 14-place ships will be shipped to Holland,

American amphibians play an important role in Norwegian airline operations. This Sikorsky S-43 is one of a fleet now flying in Norway.

"Delta" for Mexico

Business

powered by Wright *Cyclone* engines The others are fitted with Pratt and Whitney *Twin Hornets*.

Boeing Aircraft has exported two 13-passenger Model 247 transports to the Deutshe Lufthansa and a Model 247-D to the Young Marshal Hseueh Liang who is in charge of the Hupeh Province of China for the Nanking Government. The Young Marshal's 247-D is not a military plane, but can be easily converted into one, being specially furnished with separate compartments. Boeing transports are also utilized by many American airlines, United Air Lines possessing 46 of these craft and trying to dispose of them all to make way for more modern equipment. That airline has already found purchasers in China and Colombia.

Sikorsky Aircraft, a division of the United Aircraft Corporation, has exported several of its twin-engined 18-passenger S-43 amphibians to Norway, the U. S. S. R., China, French Africa and Chile.

Other recent exports of transport planes include two twin-engined, twin-ruddered Beechcraft "18" transports to Canada for operation on floats, a new Fleetwings *Sea Bird* for Canada, and two ten-place Fairchild "91" amphibians to Japan. Many of the old transport planes have also been shipped to foreign countries quite recently. Exporting firms have a great quantity of these old planes on hand and often ship a few to countries where this type of equipment can be used, these planes having become obsolete in this country. Almost all of the old tri-motored Ford transports have been exported (some mounted on floats) going to Honduras, Colombia, Peru, Costa Rica, China, Spain and other countries. Many of the out-of-date Fokker *Universals* and *Super-Universals*, Keystone *Commuters* and *Air Yachts*, Curtiss *Condors* and *Kingbirds*, Sikorsky S-38's and S-39's, Stinson A's, Douglas *Dolphins*, Wacos of all descriptions, Travel Air and Hamilton seaplanes, Flamingos, Fairchild 52's and 71's, and several types of Bellanca planes have been shipped to all sections of the globe.

Airplanes are by no means the only type of aeronautical equipment to be exported from the United States. Many types of engines have been shipped to foreign states for installation in foreign commercial and military aircraft. Many power plants have been exported to be used as replacements for engines now installed in planes of American manufacture that are flown "over there." Pratt and Whitney, Wright and Menasco are the largest exporters of airplane engines. Pratt and Whitney and Wright power plants are utilized throughout the world. Menasco engines, being less powerful than the P&W and Wright engines, are less extensively used, being fitted on planes in Germany, China, Japan, Latvia, Great Britain and Poland.

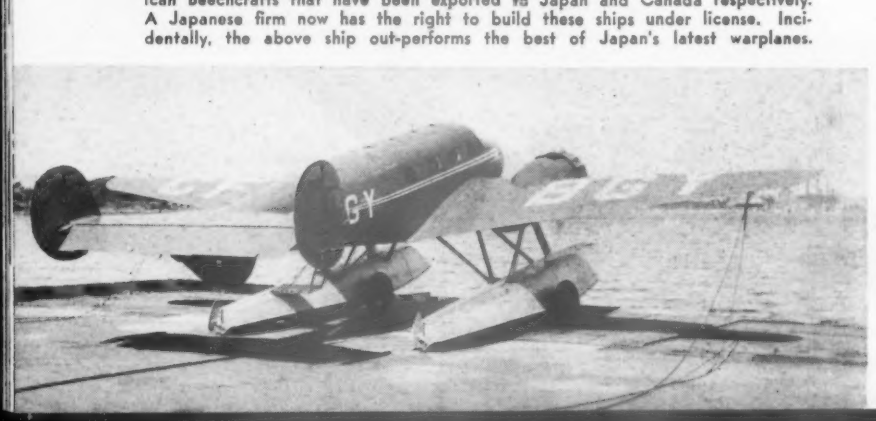
Hamilton Standard propellers, which assist many of the aforementioned motors into the air, are used in many countries. A number of foreign manufacturers, including Junkers, De Havilland and His-

This Bellanca "Airbus" is doing yeoman service in the wilds of northern Canada. Huge loads are a daily chore for this rugged ship.

American Fairchild monoplanes have been used almost exclusively in Canada's interior for years. This forestry patrol ship still flies its daily watch.

This deluxe, lavishly-equipped Howard monoplane recently was delivered to a Canadian buyer. Aircraft in that country practically replace trains and autos.

The single-engined biplane above and the twin-engined transport below are American Beechcrafts that have been exported to Japan and Canada respectively. A Japanese firm now has the right to build these ships under license. Incidentally, the above ship out-performs the best of Japan's latest warplanes.



pano-Suiza, having secured the rights to build these props. Rolls Royce-Bristol (Rotol) of Great Britain have procured the manufacturing rights for the Curtiss electrically-controlled feathering propeller. This Curtiss prop is not very widely utilized outside of the United States, where they propel numbers of Uncle Sam's fighting craft at present.

American manufacturers who sell design rights to foreign firms do a great deal of exporting. When a foreign manufacturer purchases the manufacturing rights to a certain airplane or airplane component, the contract usually states that the exporter of these rights has to furnish the importer with sufficient tooling and dies to begin production immediately without much difficulty. Very often semi-finished castings are exported along with the tooling and dies. The Aluminum Corporation of America (Alcoa) is a large exporter of aluminum products, shipping streamlines and other products abroad. The Aviation Manufacturing Corporation is another exporting firm that ships various portions of airplanes overseas. These segments of planes are packed in wooden boxes, after having been sprayed with a light rust preventive before being shipped.

Aircraft are exported in a fashion quite similar to the exporting of airplane parts. That is, some planes are boxed and some sprayed before being sent broad.

Let us start on the West coast, where almost all of the factories that manufacture the large transport planes are situated. When a plane is to be exported to Europe it is flown to New York. The planes are flown to the East by company pilots and sometimes transport friends and relatives of the pilots and officials of the company that is exporting the ship.

These passenger planes for export are flown cross-country bearing either foreign registration letters or special ferry numbers. The ferry numbers are placed on the planes by the Department of Commerce when the importer, who may be a distributor for these planes overseas, doesn't know exactly to which customer the plane is going. The planes are required to fly with some means of identification upon them. All numbers, registration letters, names and insignia are painted on the ship at the factory at the order of the importer.

Very often special orders are received from overseas requestiong various modifications of the ships. For instance, the Royal Dutch Airlines (KLM), one of our largest customers, has its planes especially furnished with only 14 passenger seats instead of the conventional twenty-four due to restrictions set up by the Netherlands government. Also, very often orders are received at the factory to paint the entire airplane, a very extraordinary request it may seem to be, but entirely necessary. The paint is applied only to metal covered airplanes to prevent the scratching of the Alclad skin when flying over desert regions.

When the exporting season is at its height, the passenger planes arrive in New York at the average rate of two ships a week. This includes planes of Douglas, Lockheed and Sikorsky manufacture, as

these types are the greatest number exported.

After a plane for export arrives in New York it is demounted, packed and shipped in a very interesting manner. Under the supposition that a Douglas DC-3 is being exported, we will follow the operations performed before it is freighted away. Immediately after the arrival of the plane, the fuel is drained from the wing and fuselage tanks. The engines are then revved up and all the fuel not formerly drained is used up. The plane is then pushed indoors and the engine cowls, tail cone, rudder, flippers, ailerons and flaps are removed. After all the fabric covered sections are removed, the wings and horizontal stabilizers are demounted. The engine cowls are either sprayed or washed with a cleaning fluid before being fitted over the engines again, the engines being sprayed with a noncombustible cleaning fluid and having all spark plugs removed before the cowls are replaced. Dummy plugs are placed in the spark plug openings in the back of the cylinders first, the front plug apertures being sprayed with a light rust preventive before the dummies are inserted. The cowls are placed over the engines and covered with strong canvas. The faces of the cowls are also spread with canvas, the propellers remaining in place during the operation. The prop hubs are then encased in aeronautical oilcloth.

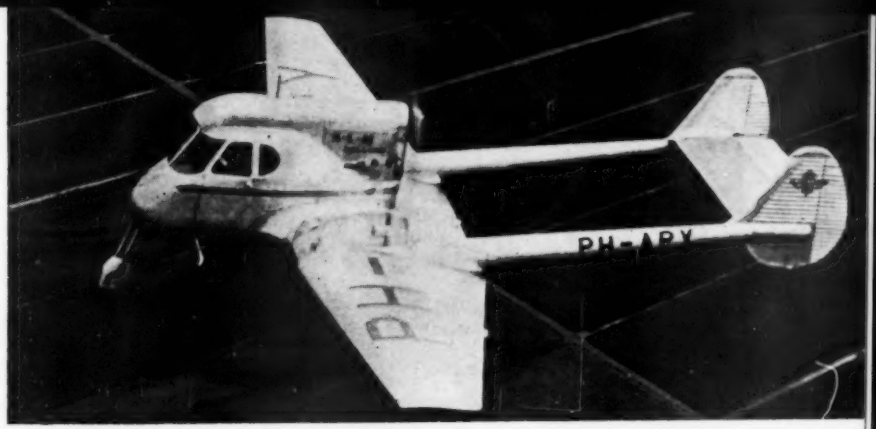
In the meantime, the wing and stabilizer roots are covered over with plywood, the wing roots having metal plates fastened over the wood to assist in the loading when being placed aboard ship. The hoisting cables are attached to these metal plates. The landing gear well openings are then covered with plywood, the landing gear remaining in its extended position. All small intakes, outlets and other openings are covered with adhesive tape to prevent the entrance of salt water. Salt water is harmful to metals, as it promotes corrosion.

The interior of the plane remains unchanged except for the removal of the two-way radio equipment which is immediately shipped back to the West coast for reinstallation. The radio equipment is removed as it would be quite useless to the importer due to the difference in the codes used on airlines in the United States and in foreign countries. The interior of the passenger cabin is not changed at all having been prepared for export at the factory. The floor, ceiling and walls have been papered to prevent soiling of the upholstery.

The plane is now prepared for the final operation, the application of a rust and corrosion preventive to all the metallic portions of the ship. The preventive that is used is a greasy, solid substance that is heated and melted into an oily, liquid form before being applied. This preventive comes in various grades that are used under different climatic conditions. It is sprayed on the metal parts of the plane with an air-pressure gun. The ship takees on a yellow-green appearance after the preventive is sprayed on. The solution remains on the plane in a greasy unhardened form until removed with either gasoline or kerosene

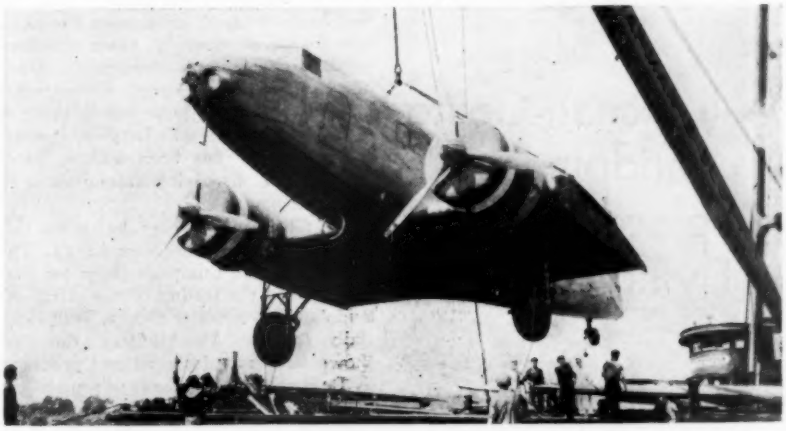
The wings, after having been sprayed,

(*Concluded on page 76*)



Even the much-discussed American Stearman-Hammond "safety plane" has been exported. The above ship was bought by a Dutch airline for "nose-wheel" training.

A Czechoslovakian shoe manufacturer is listed among many foreign owners of Lockheed aircraft. Before shipment, his pilots crashed this ship in Chicago.



Probably the most common American manufacturer's name abroad is Douglas. This company's airliners are standard on many of the world's leading airlines. The above DC-3, destined for Sweden, has been taken apart, sealed and is being hoisted aboardship. The Douglas flying boat below went to Russia.

Will Ocean-Going Landplanes Replace Present Flying Boats?

EVER since the first trans-Pacific and Trans-Atlantic airliners made their first flights successfully, there has been much discussion concerning the feasibility of flying the cheaper-to-operate landplane over the same run in place of the more-logical boat. Largely, though, this "problem" has been nothing more than passive discussion among those in world aeronautics.

Great Britain, however, has taken this little problem into her own hands. The photographs on this page show her first step toward the testing of the safety-of-landplanes-over-water theory. Built especially for the Air Ministry, the ship shown here was designed and produced by DeHavilland, who calls this model the *Albatross*. The four engines are air-cooled *Gypsy-Twelves*.

Known technically as the DH-91, the *Albatross* has an estimated top speed of 250 m.p.h. Fully loaded, the ship is said to weigh 25,000 lbs. Little else is known concerning this type except that extensive test flights now are under way by the Air Ministry. It is expected that trans-Atlantic test flights also will be made some time this year. Both pictures on this page were made during recent tests.

Britain puts much stock in the safety of the landplane alongside the flying boat in the fact that four engines will be used. The efficiency and reliability of present-day engines practically precludes a major failure.

Secret Dirigible Gas Cells?

By JOHN W. HIGGINS

With the Zeppelin fighting to come back into world aeronautical prominence, this interesting discussion may be more significant than it would appear.

PROUDLY it was asserted in a news item sent out by the Berlin office of the International News Service that German airship success could be attributed to the superiority of the lifting gas cells of their airships over all others. This revealing report was made several weeks before the *Hindenburg* went up in flames while mooring at Lakehurst in static air and valving off the inflammable hydrogen to facilitate a quick landing The dispatch appeared in a New York paper as follows:

SECRET GAS BAG HELD KEY TO ZEP'S SUCCESS

BERLIN (INS.)—There is a tiny, closely guarded factory at Tempelhof, southern suburb of Berlin, which holds the key to Germany's success in dirigible construction.

Visitors are allowed a glimpse of the interior of this unique plant only with special permission and chemists as well as workers, the overwhelming majority of whom have been working here for more than 15 years, are pledged to strictest secrecy.

Only two men in the world, the director of the German Balloon Fabric Company and Dr. Ludwig Duerr, chief constructor of the Friedrichshafen Dirigible Construction Company, know the secret formula employed in manufacturing the company's products.

It is here that the giant gas bags for Germany's dirigibles are made, bags which could not be made with similar perfection and lightness by anybody else in the world, the company's executive proudly assert."

The commercial airship, as a type, has shown it as a safe, comfortable and efficient over-ocean carrier. That the *Hindenburg* went up in a pall of smoke can only be charged to having the deadly explosive hydrogen as a lifting medium. The lesson of this holocaust is that if the airship is to survive there must be the fullest of international cooperation.

The United States recently opened the way by making available to all nations the only safe life blood for airships, helium gas. Our willingness to share this God-given resource for peaceful purposes with the civilized world is indeed a gesture of good will that comes at a time when such are lamentably few.

It has been demonstrated time and again that no one nation can prosper by itself alone. They are in trouble now the world over. Unquestionably there are certain fundamentals which must be corrected before peace and prosperity can be cemented on a firm foundation. This unfortunate world condition of the present encompassing prejudice, persecution and consequent misunderstanding are the real impediments to international trade and complete world recovery.

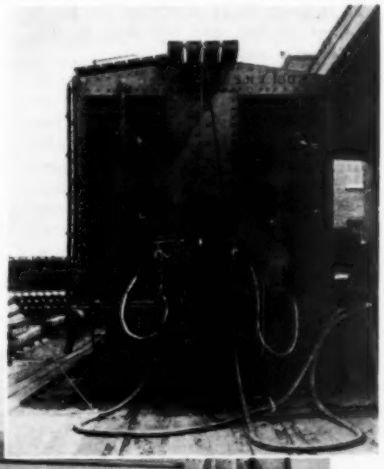
Airships, of course, will not solve these many problems, but if in the process of their world application they are instrumental in planting the germ of "live and help live," their immediate progress will indeed be worth speeding.

When Dr. Eckener appeared before the Military Affairs Committee in Washington after the tragedy he was questioned closely as to whether Germany had any intention of using dirigibles for war purposes. He replied that in Europe today the airship was no longer a military threat. because potential enemies were so close to each other's borders large squadrons of warplanes could come quickly and by sheer force of numbers quickly destroy any large rigid airship. This may be assumed for the airship, in a military sense, today would only prove valuable to a nation such as ourselves having large ocean expanses on either side needing extended aerial surveillance.

If Germany is sincere and wishes the commercial airship to really expand for the benefit of all entering the field the secret formula for the manufacture of these superior gas cells should be made available to all willing to make the airship an international carrier of importance.

It is not hard to see if this secret is retained that Germany supplied with the safe American helium will have an advantage over all other dirigibles in foreign trade.

There is a possibility if our airships had cells of greater gas tightness and lightness they may, when fighting to remain aloft, have fought their way home. Perhaps our



The contents of the freight car below and to the right has been a source of bitter controversy among world airship experts. They are tanks of helium.

gas cells being heavier and becoming more and more porous with age increased the back diffusion of air at times lowered the lifting efficiency of our buoyant medium helium when every pound of lift counted most. Therefore the *Akron* and *Macon* might have remained in the air had they been equipped with gas containers of greater superiority.

Without a doubt the German gas bags are as claimed, for the use of hydrogen, made it imperative that back diffusion of air be held to a minimum. Air entering these cells over a certain volume would create a dangerously explosive combination. It is, therefore, reasonable to concede the superiority of these lifting cells.

However, regardless whether we share the secret of these bags, the United States has an "ace in the hole" in the metalclad type of construction. The only successful operating rigid airship in the world today is the eight-year-old metalclad ZMC-2, which ship has proven this type peculiarly suitable for helium. With gradual successful evolution into larger sizes it may well be that the metalclad will be the *American* type airship, the remarkable career of our 150 foot all metal ship indicates such future development

While helium is several times as expensive as hydrogen and has 8 percent less lifting power, it is more economical as it can be repurified over and over. One filling of helium with the proper care and small replenishments as necessary after each flight will do an airship over a long period.

German airshipmen have many times been criticized for valving large amounts of hydrogen in preparing to make a landing. It is asserted as much as ten times the volume of the ship was lost in this manner over a season.

American ingenuity invented a device to do away with the valving of the more expensive helium in landing operation. When an engine consumes fuel considerable water vapor is produced in the exhaust gases. In our airships the exhaust gases were led through air-cooled condensers and the condensed moisture was distributed to various rubber ballast bags by pumps. This procedure was called "water recovery" and was very successful.

Briefly the fuel used was counterbalanced by the water ballast gained from the recovery system and the airship was kept at practically the same weight throughout its journey. Valving off helium to land was therefore unnecessary, the power of the engines was sufficient.

The Helium Bill recently passed by the Congress and signed by the President, contains certain features not likely to be received with great enthusiasm on the other side, for if the Germans buy helium from America under the terms of the new law they will have to give up their South American service unless we also are included in this valuable trade. Paragraph (B), Section 3, of the Act, now reads:

"That helium not needed for government use may be produced and sold upon payment in advance in quantities and under regulations approved by the President, for

(*Concluded on page* 91)

"Clear and Unlimited"

By SWANEE TAYLOR

(Through the courtesy of the Scripps-Howard newspaper chain, and the Pittsburgh Press, the following is reprinted in the interest of the vast but scattered army of private fliers who have long needed such a champion.)

FLYING WITH
AL WILLIAMS

By Major Al Williams
Scripps-Howard Staff Writer

"Nov. 22nd, 1937.—A voice from behind a big cloud is whispering to the *Gulfhawk* and its pilot:

" 'Say, Feller, you've lost all idea of the fun of flying. You are so loaded down with retractable landing gear, controllable pitch props, super-chargers, carburetors . . . and a dozen other gadgets that your flying is merely sitting in a cockpit with both hands full of science and not one moment of comfort. With your radio you fly for miles without seeing the ground. Turn the directional radio beams to "off" and you'd get lost in a jiffy.

"Before taking off you must submit flight plans to the Airway Traffic Control and have them approved. You fly at altitudes where it's always cold and there's ice in the air. There are only 280 airliners in the country and they run you ragged trying to keep out of their way. They always take off before you, and you can't land while one of them is within 20 miles of a port. Even the airport radio won't talk to you if there's a chance of chatting with an airliner. You're not an airline pilot, but with your 1,000 h.p. engine and all the scientific gear you carry, they put you in the same class—and the Bureau of Air Commerce is always on your neck.

'There are only 500 airline pilots in the country. But us, the fellows who fly privately, we number about 50,000 with pilot licenses from student on up. Yes, sir, 50,000 of us. Didn't know that, did you? We live and fly never closer than 30 miles of any airway if we can help it. The air between the ground and the 1,000-foot level belongs to us, and we don't want any of you Big Shots prowling around down there, either. We fly from airports that won't have anything to do with airlines. These are the airports that were too little to get airmail service, or got sick of trying to stretch their runways every spring, and finally decided they'd rather have a hundred or so of us little fellows than any two airlines. And they quit the airline business because they thought they'd have to chromium plate the runways eventually.

'From the ground up to 1,000 feet; that's us. When the weather is too bad and visibility ditto, we stay on the ground. Can't drive an auto in any kind of weather, and neither can you fly an airplane in any kind of weather, no matter how much science you have on board. We fly low enough to see the chickens all the time, and when you get higher than that you are scientificking, not flying for fun. Our planes are little fellows, costing under $2,000, with wooden props, small engines that run 500 hours between overhauls, and *no gadgets*. We putt-putt along at 75 miles an hour on high-grade auto gas, and we get a better mileage than you get in your car and lots more fun, too. We land at 30 miles an hour in any man's pasture. And if we run through a fence we do it slowly so we don't get hurt. We don't run into stuffed clouds when you ride with us. What's a stuffed cloud? Oh, that's a cloud with a mountain in it.

'We are the backbone of the American aircraft industry, and more and more airports are building hangars and accommodations for us. We don't want your high-pressure airways and radio beams. We'll keep you out of our territory, because there are more votes in the putt-putts than there are in the Big Ducks. As one airport manager, who is always laughing now, says; Give me a hundred or two of the putt-putts any day and I'll make my airport pay, and you can send all the airliners to Europe.

"Say, was this Voice dreaming about the future, or was I talking to myself???"

(This is the most heartening news of the decade; that a big leaguer like Al Williams is now pitching on our side. Too, our thanks to the Gulf Refining Company who quite evidently have as much compassion for the little fellow as they have keen business foresight.)

Flight Critique . . .

The *Cub* on floats: Here is a piece of flying equipment that measures up extraordinarily close to normal requirements and expected performance. Offhand, and without undergoing a withering clinical examination, it is hard to find any faults in this snappy little pontoon job.

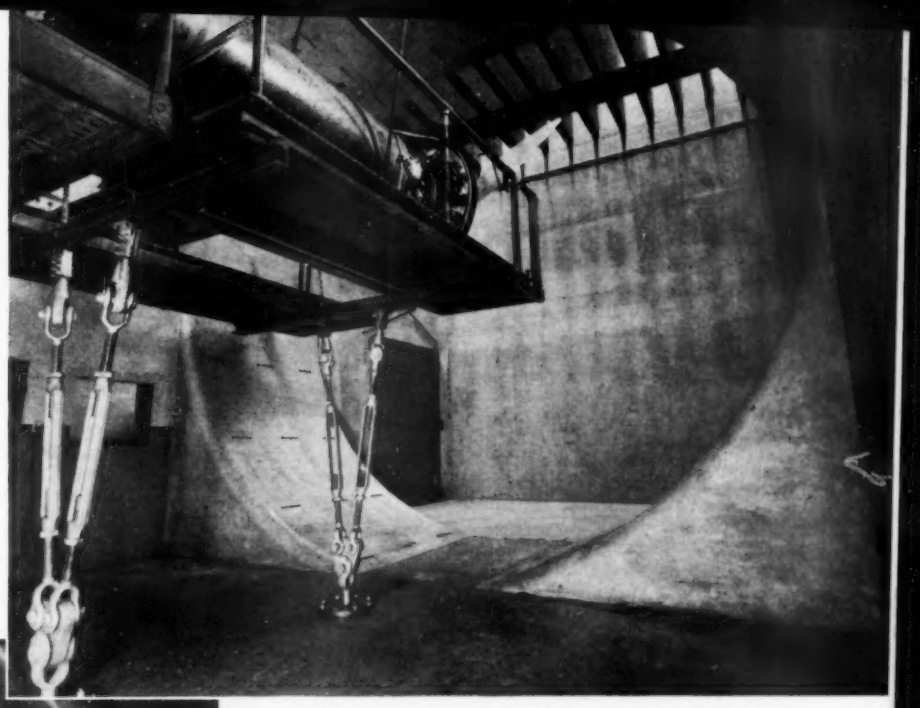
I flew the type off a wide spot in the Susquehanna River, at Lock Haven, Penna. The water was glassy and what little wind there was blew downstream. Yet with a full load of gas (no passenger) she popped out of the limpid river in about 8-to-10 seconds, and climbed right on up. Downwind takeoffs were effortless and there was no tendency to cling to the surface. As a matter of fact, she would have stalled-off a good five seconds before she finally flew. (Here's one bold brave birdman who quit stalling 'em off downwind years ago.)

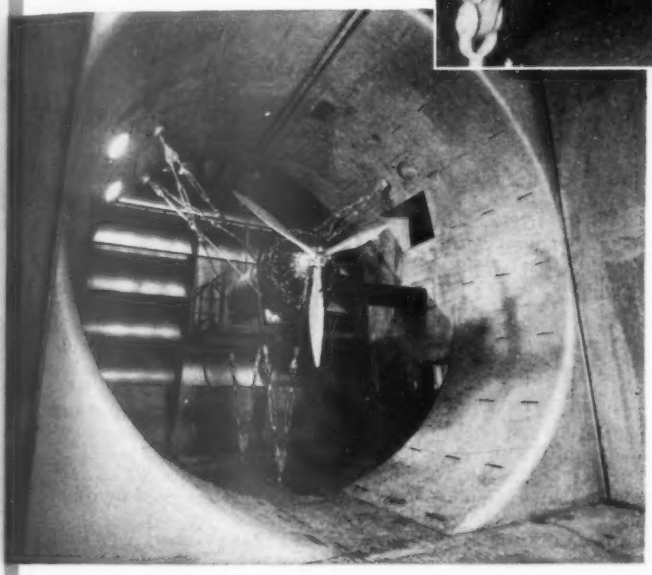
In the air the sea-going *Cub* is a bit

(*Continued on page* 89)

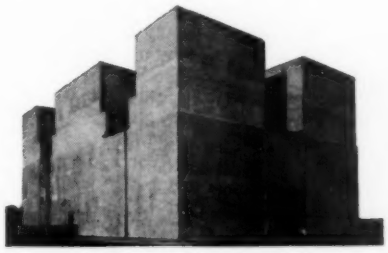
ENGINE TESTER

The photographs on this page are of the new Pratt & Whitney engine test house. Shown below and at the right is an engine mounted on the new stand. Note heavy braces against the strain.

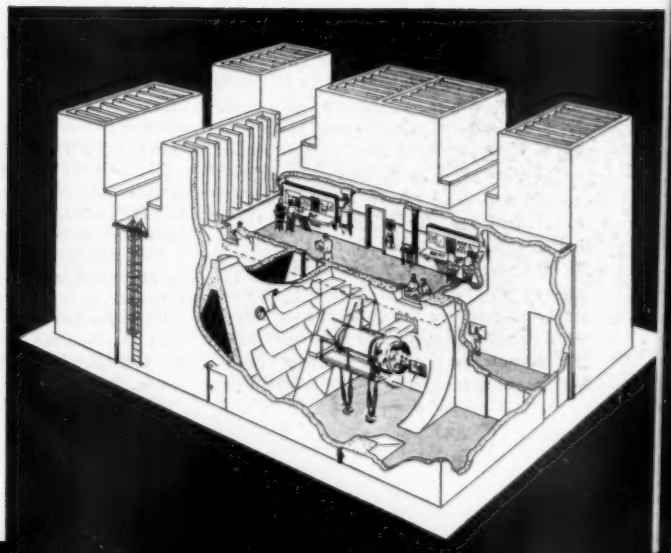




SYMBOLIZING the pronounced trend toward the use of more powerful engines in modern commercial and military aircraft, a new engine and propeller test house just completed at East Hartford, Connecticut, is capable of testing engines twice as powerful as any in use today. The new test house contains four identical test chambers, each of which can accommodate engines up to 3,000 h.p., whereas the largest aircraft engines now in production are rated at 1,500 h.p. Moreover, the test chambers are big enough to swing the huge 23-foot diameter propellers that will be required with these high powered engines, and which will dwarf by comparison the propellers now in use, the largest of which is not more than 13 feet in diameter. It will thus be possible to run tests simultane-



The control panel is below. At the right is the test house, both inside and out.



ously on engines and propellers with resultant economies both in time and expense.

The new building, whose four test chambers will supplement the 32 smaller test houses already in constant use in the Pratt & Whitney factory, is unique and modernistic in external appearance, resembling a geometric arrangement of building blocks, with no outside windows. In its construction a great deal of attention was paid to the problem of minimizing noise and vibration. The exterior walls are of concrete 18 inches thick, the entire structure containing 4,600 tons of concrete and 160 tons of reinforcing steel. In addition, a new type of sound-absorbing acoustic material known as calistone is suspended in parallel rows within the intake and exhaust stacks. It is of course impractical to completely eliminate the noise of high powered engines running at full throttle, but tests have shown that even with engines of 1,500 h.p., the noise emanating from the stacks of the new building is substantially below that of the older test houses where smaller engines are tested. As engines of greater power up to the limit of 3,000 h.p. are developed, it is expected that the noise can be held to substantially the same level by increasing the height of the sound-proofed stacks.

Within the structure the four test chambers are grouped around a central control room which is located on the upper level, and which is equipped with four control desks for the operators. At each of these a new double type of soundproof window permits the operator to look into the test chamber and observe the operation of his engine during the run. In addition, the arrangement of doors is such that there are always two soundproofed doors between the engine chamber and the control room. A further noise reduction is accomplished by the use of an acoustical ceiling in the control room. This is suspended below the concrete ceiling far enough to house the fresh air and exhaust air ducts. As a result of these soundproofing measures, it is readily posible to carry on a conversation in the control room with all four engines running, the noise level being reduced from around 135 decibels in the engine chamber which is even higher than that of a boiler factory) to around 78 decibels at the control desks.

Erected at a total cost of more than $200,000, the new structure contains many interesting technical features. The original Pratt & Whitney idea of using a cable suspension system for the engine mounts has been retained, but with the added feature that some of the cables have been crossed fore and aft to resist propeller thrust without the addition of special thrust struts. The ends of the cables are anchored in rubber-cradled mountings to provide flexibility simulating as nearly as possible the conditions encountered in actual flight. The section of each test chamber in the plane of the propeller has been made circular to permit the

(*Concluded on page 70*)

Our Front Cover; a Douglas Airliner

THOUGH readers of POPULAR AVIATION are familiar with the Douglas airliner shown on the front cover, the picture itself was so unusual we thought it worthy cover material. The ship, an American Airlines transport landing at Chicago's Municipal airport, was caught in the unusual position by E. H. Pickering, aviation photographer prominent on the East coast.

Thousands of photographs have been made of Douglas airliners in practically every conceivable attitude, but this photograph is unusual in that the ship, though it was traveling close to 80 m.p.h., has been stopped dead with an excellent degree of clarity. Note the fact that the flaps have been lowered only partly by the pilot. This, incidentally, is a trait whereby many airline pilots can be recognized. Some of them like the modern speed-arresting flaps; others use them as little as possible.

Photographically speaking, this picture is an excellent example of the combination of a high-speed camera and a wide awake photographer. The picture was shot at 1/500 of a second and, because of the fact that it was taken at practically right angles, the photographer had but a fraction of a second to act.

How Does Flying Affect Your Health?

WHAT effect does continued flying have on the personnel so engaged? That is, barring accidents, what out of the ordinary happens to the person whose life work is more or less in the air?

The U. S. Army Air Corps has made an exhaustive study of the question and has found that there are certain occupational diseases incident to flying which have been noted as occurring to an unusual degree among military flyers.

It is pointed out that the pilot who flies only for sport, or in cabin ships, probably is not affected in the same manner as the service pilot. However, the man whose daily job it is to engage in flights of a military character may look forward to certain diseases.

The reason for such disorders is simply that man was not designed for flying and was not equipped by nature for it. Consequently, going into the air imposes strains and stresses on his physical and mental makeup that it cannot altogether withstand.

"What the birds do naturally and easily, man must accomplish mechanically," states Colonel Levy M. Hathaway, one of the outstanding flight surgeons in the Air Corps. "Meanwhile, he cannot change his physical makeup to conform to these new requirements; his organs were not primarily fashioned to function perfectly under the conditions imposed by this entirely new environment.

"The demands on his earthly constitution must be greater than generally realized, since it is to be inferred that such an unaccustomed task must entail stresses and strains in proportion as a man is physically and psychically unspecialized for its performance.

"It is true that man has great powers of adaptability, otherwise he could not fly at all, but it is equally true that he is not specialized for flying."

Colonel Hathaway states that it is not in accordance with the economy of nature to provide us with faculties for which we have no use. He points out that earthworms and moles have little or no eyesight because they have no need for it.

On the other hand, birds are provided with visual equipment of the highest order, greatly superior to our own. The colonel states thit it is possible that when men have been flying as long as they have been walking, future men may develop special faculties and a body that will function as perfectly under the conditions of flight as do those of birds.

"Birds have excellent visual accommodation, eye muscle balance and depth perception," Hathaway states. "We have seen a hawk fly at terrific speed among thick shrubbery in pursuit of its equally swiftly dodging prey, while pursued and pursuing alike avoided collision with any obstacle.

"Wild fowl fly wing to wing in formations which military airmen by conscious attention and unceasing vigilance strive to emulate. Let one of our pilots in such a formation relax for a moment or misjudge the distance to another plane—the wings touch and the planes fall to earth. Not so the wild fowl equipped by nature for formation flying.

"They also have other equipment which we may envy. It would be easier for our pilots if they, like the carrier pigeon, had in their heads some natural equivalent of an earth induction compass combined with a turn and bank indicator which would enable them to find their way through darkness, wind and fog across those trackless skies which separate the continents.

"When the earth is obscured by clouds and the horizon invisible, the airman cannot depend upon any inherent sense of equilibrium or of direction. He is inadequate in this respect, as in many others pertinent to flying. Bred on the ground, he is physically adapted only to moderate changes of barometric pressure and equivalent oxygen supply.

"Deprived of his accustomed alveolar oxygen pressure, at high altitudes, his judgment suffers, conscious attention fails, circulation likewise, and unless relieved he perishes. Adjusted to slow locomotion, his organs are none too tightly anchored to resist the violent and sudden changes with relation to gravity and inertia which aerial acrobatics demand of him.

Those Parachuting Russians

By LUCIEN ZACHAROFF

Parachutes and guns are as common to Russia as ice cream cones to Americans.

These are a few of Stalin's parachuting warriors. Whole battalions of these men have been dropped from the skies, each armed with a machine gun.

IMAGINE a town of several hundred inhabitants each of whom is either a student of or an instructor in parachute leaping!

If this is too much of a strain on your imagination, relax and accept such a municipality as a fact. For The Parachutists' Center is a full-fledged reality near Zvenigorod, some 35 miles north of Moscow. With the courses lasting for a full year, the students, in addition to parachute jumping and parachute folding, receive general educational instruction including at least one foreign language.

The idea of the parachute originated with that brilliant Italian jack-of-all trades and master of most of them, Leonardo da Vinci. The first actual leap was made in 1617 by the Venetian Vernazzio, who descended with the aid of a cupola of his own construction from a tower about 10 meters high.

But it remained for the 20th century Soviet Russians to advance the art and science of parachuting to its present heights, and it is the same Russians who during the past few years have been tenaciously holding on to and breaking anew their own world records in various classifications of the sport.

Soviet sportsmen have jumped from the greatest altitude ever attempted, negotiated the most complex delayed-opening jumps, jumps at night, jumps into bodies of water, jumps of a few thousand participants simultaneously, etc.

Although the early parachute jumps in the U. S. S. R. were made during the 1919-1921 period of the bitterest fratricidal strife, parachuting did not come into its own as a mass pastime until about 1930, the year when the well-known pilot L. G. Minoff made the first exhibition jump.

About the same time Minoff visited the United States to choose the most suitable type of parachute for conditions prevailing in his country. He also pioneered in early instruction of the uninitiated.

It was not until 1933 that the *Osoaviakhim*, the all-union society for popularizing aviation and anti-chemical defense, had established its first parachute circle which toward the end of the same year graduated 1,200 men and women. The *Osoaviakhim* today has nearly 8,000,000 members.

Thus, parachuting got off to a flying start. About 4,500 men and women leaped from the aircraft in 1934, while countless thousands in all parts of the country jumped from specially built towers where captive parachutes are employed, descending at a reduced tempo.

Parachuting has taken the Soviet Union by storm, winning a multitude of fans not only in large cities but on hundreds of collective farms. In 1935 nearly 1,000,000 persons jumped from towers, the number of which is nearing 1,500. On their days off many a Soviet family repairs to the nearest Park of Culture and Rest there to climb a tower and a few minutes later to float languidly down to earth.

With parachute stations springing up like mushrooms, during the first six months of 1936, 10,500 jumped from airplanes. Moscow's All-Union Parachute Center is busily turning out instructors of first category.

Why this unparalleled and unprecedented enthusiasm for parachuting? It appears that a firm conviction prevails that the sport develops alert and healthy citizens, endows them with courage and ability to think fast. In addition to the peacetime diversion it offers, parachuting is regarded as of great military value and officials of the Defense Commissariat take pains to stimulate interest in it. It must be noted, however, that in other countries military authorities do not necessarily lean to utilizing parachute jumping for their purposes. Whether this is due to their low opinion of its usefulness or technical obstacles is difficult to say.

What part the parachute has played in making the U. S. S. R. the world's most airminded nation and strongest air power is for the historians of the future to determine precisely. Today the fact stands out that neither normal peacetime sports program nor the Red Army's annual maneuvers are conceivable without parachute jumping.

Chief M. Zabelin of the All-Union Parachute Center described for us the part his institution had in last fall's war games of the Moscow Military District. Immediately after the alarm was received, the parachutists were summoned, the parachutes and other equipment packed, and the same evening a train was carrying 120 instructors of first category to the "front."

"When we arrived, our fighting assignment was given to us. Our detachment was to land in the section occupied by the aviation units of the "Blues," to "annihilate" their aircraft, personnel and airdrome.

"It was decided to land 15 kilometers away from the airdrome. After landing we intended to hike to the airdrome, cut it off from the populated points en route by depriving them of communication means, and then to seize the airdrome itself."

In a few hours Chief Zabelin and his jumpers, fully armed, were gliding through the air, aboard heavy transport planes. It was about 450 kilometers to the "enemy" lines. Darkness enveloped the planes when their navigator finally signalled that they were near their destination.

The parachutists from Moscow began to creep out on the wings and fuselages of the planes. A large field dissected by a highway loomed beneath them.

Another signal command and from all five of the giant ships the parachutists hurtled down like a bunch of beans, none of them in a hurry to pull the cord. All separated from the aircraft with exceptional speed.

In a few minutes all participants of the unusual expeditionary force were on the

ground and carrying the parachutes to a spot where they were promptly followed by two folders who jumped right after them and were fast packing the 'chutes on the carts. But let Chief Zabelin resume his story:

"Sent out ahead, a reconnoitering group under Captain Belousoff had cut off both roads leading to the village, 'liquidated' the telephone lines and made it thus impossible for the enemy to communicate the news of our landing. We met some collective farmers to whom we explained the nature of our operation. They promised not to tell anyone about our arrival and had kept their promise so well that when our folders, upon completing their job, attempted to rejoin us, they were unable to learn which way we went.

"Our subsequent progress was not easy. We went through the forest, sending scouts ahead and on the flanks, lest we be caught unawares. At times the darkness was so thick that we could not see the people immediately in front of us.

"About four or five kilometers away from the airdrome we broke up into three groups. Two of these were assigned to cut off the roads to the airdrome, while the latter was being 'raided' by the third one.

"Lack of self-control on the part of one of our men had somewhat disrupted our plan. We were all intolerably thirsty. And so, one of the parachutists approached a cottage to ask for a drink. In response to his knocking it was not the owner who came out but a detachment of 'Blue' aviation mechanics.

"In order not to be discovered and liquidated in the very beginning of the operation, we were compelled to take 'prisoners' the technical personnel of that group. In the meantime, somebody's automobile approached. We had to capture that too. Next, to nip in the bud any opportunity of informing the 'Blues' of our landing, we had 'liquidated' the telephone station, seized the garage with all the autos in it, in this manner 'knocking' them out of service.

"It was deep night. At a signal our detachments advanced on the 'enemy'. Unexpectedly invading the settlement, the parachutist group captured the staff of the aviation detachment. The flyers had already been seized on the way to the airdrome.

"Airdrome guards were 'liquidated' swiftly and silently. It only remained to 'settle' with sentries posted directly at the airplanes. Thanks to our parachutists' clever disguise, they were permitted to come along and the planes had been seized and conditionally disabled.

"By 5 a. m. our task was completed. Two hours later we were peacefully seated in the dining room, breakfasting next to our 'adversaries.'"

Expert opinion on the Soviet application of parachuting for military objectives was voiced by General Loiazot, head of the French delegation which attended the Kiev Military District maneuvers in 1935:

"The parachute expeditionary force

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the NATIONAL AIR BOARD Says...

Dr. Alexander Klemin, Chairman

AT ITS 19th meeting, the Air Board made the experiment of discussing fewer topics and dealing with them somewhat more exhaustively. The experiment was satisfactory but it is not certain that the same plan will always be followed. The guests welcomed at the lunch were Leslie Cizek, one of the best informed men in the country on aviation insurance, and George and William Bessler and John W. Hession, Jr., who have pioneered so successfully in the development of light steam power plants.

A Serious Situation

There is not the slightest doubt that a very serious situation has arisen in the matter of airports, in so many cases rendered obsolete by the development of the huge, modern airliners which require longer and more rugged runways and better approaches. It is a terrible thing for the citizens of a municipality, when after spending of their resources and energies to the utmost for many years, they are suddenly told that their efforts have been useless, that their airport has lost the highest rating, that it is in fact obsolete.

Alfred MacDonald, the manager of the Wichita Municipal Airport, at the recent Chicago Conference of the Municipal Association gave a striking example of such mishaps. Ten years ago this city of 115,000 people, with limited financial resources, undertook the development of what was intended to be a first-class airport. It bought an entire section of land, 640 acres, leveled, graded, planted grass, constructed a fine hangar, lighted the field, built a splendid administration building, and did everything required for an A-1 airport. In the development and subsequent maintenance and improvement of its airport the Municipality of Wichita was constantly in touch with Federal authorities, and every step was taken with full approval of the Department of Commerce.

Mr. MacDonald pictured the grievous situation of Wichita in the following words: "But now, having spent our money, we are told that our splendid airport will not be suitable for the new type of transport and Army planes which are expected to be put into service next year. We are told further that in order for the airport to qualify as a suitable airport at which these new heavy planes may land it will be necessary for us to spend an additional $300,000 for hard surfaced runways. After having spent an amount of $480,000 on the airport, I do not believe the people of this city will approve an additional expenditure of city money amounting to $300,000."

We believe that this situation is typical of many centers, even of such a big city as Newark, New Jersey, with the burden, of course, falling more heavily on the smaller cities.

Airports Just Growed

Lieutenant Richard Aldworth who introduced and led the discussion on the airport problem, attributed this sad situation to the fact that our airports had "just growed like Topsy", without any coordinated plan, or national policy. The forthcoming airport conference in Washington would probably end in just talk yet, said Lieutenant Aldworth, airports of first class rating were not important just to commercial aviation, but were vital in national defense. Was it not necessary to have a number of airports suitable for the largest Army planes on the Eastern seaboard, between Boston and Charleston, where lay a territory offering every temptation to foreign attack? The Department of Commerce had at most one or two men concerned with airports. The WPA was an emergency organization soon doomed to disappear. The municipalities were tired of being solely responsible for airport work, and moreover airports were a matter of interstate flying, and much more than a local matter.

Lieutenant Aldworth finished with an eloquent plea, for a national policy and for the cooperation of Federal, State and Municipal authorities in formulating and executing this policy, with the Federal government carrying at least part of the burden.

Difficulties in Municipal Operation

From a heated discussion, there appeared to be other difficulties associated with Municipal Airport operation. Newark might spend $200,000 a year on its airport, but the return in rents or dues was infinitesmal. Rules for traffic control vary from municipality to municipality while flight operations extend from coast to coast. The Commissioner of Pittsburgh County has threatened to kick TWA off the landing field because their operations supposedly impeded the placing of some gasoline tanks by the WPA. In Detroit, political considerations have forced the use of the inefficient, ill-equipped dangerous city airport, whereas the Wayne County airport is splendidly adapted for all flying operations.

Limiting U. S. Intervention

On the other hand some cogent arguments were made against Federal intervention into the situation. The argument that municipalities cannot build and maintain airports, and that it costs

(*Continued on page* 92)

Monoplane or Biplane?

By JAMES P. EAMES

Here is the age-old aviation question brought up to date. The author is a prominent engineer.

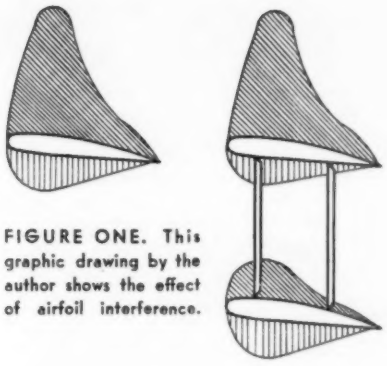


FIGURE ONE. This graphic drawing by the author shows the effect of airfoil interference.

THE last few years in aircraft design has witnessed a distinct trend of development toward the monoplane structure both in the commercial and military fields. The tendency in the latter bracket has not been quite so pronounced, the biplane still holding its own fairly well in all the existing categories of military aircraft classifications. The design and performance factors which influence the operation of heavier-than-air structures will be considered in detail in the endeavor to determine which type, monoplane or biplane, becomes best adapted to certain definite performance requirements.

The monoplane structure embodying a single main plane member maintains a high degree of operating performance, since the single unit functions without interference from any superimposed member. In the case of the biplane structure, the turbulent air flow created by the upper wing seriously impairs the suction characteristics of the lower member. Cambered airfoil sections have their profile curves designed with a view to creating an area of negative pressure above the upper surface of the member. The corresponding suction contributes 65 percent or approximately two-thirds of the total lift of the wing, the remaining one-third being supplied by the positive pressure generated beneath the lower surface of the airfoil section. It becomes readily obvious that if this suction is seriously interfered with as in the case of the biplane structure with superimposed wings, a considerable loss of lift results. In fact it is generally conceded that, while the upper wing of a biplane structure functions practically as though it were an isolated unit, the lower wing, under the influence of the upper member, undergoes a loss approximating one-third of the sustentation of an equivalent isolated unit. From this fact we may readily assume that the lift per square foot on a modern biplane structure approximates 85 percent of that attainable with a similar monoplane.

Figure 1 illustrates the physical application of multiplane effect. The shaded areas indicate the vacuum and dynamic air pressure distribution over the airfoil surfaces of monoplane and biplane assemblies. The ordinates of these diagrammatic areas are proportional to the pressure intensity at any point. Note the materially reduced vacuum, or area of negative pressure, upon the lower biplane airfoil which is reflected in lowered values of lift.

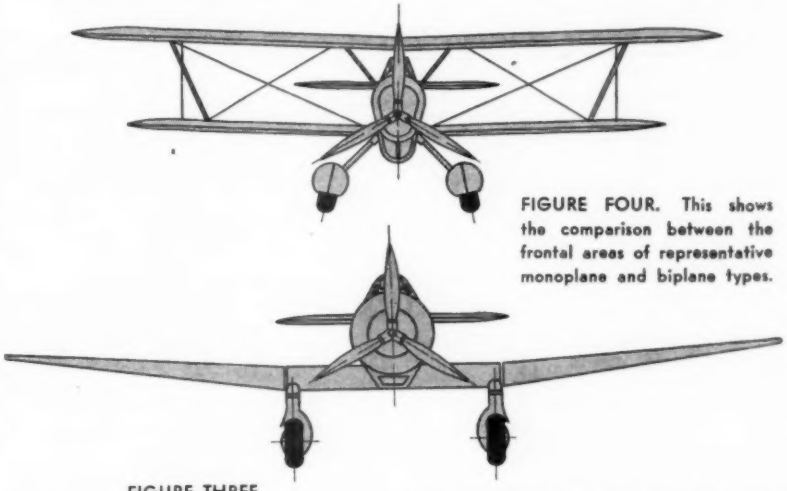
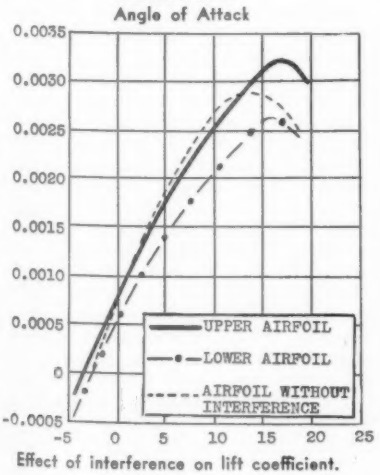


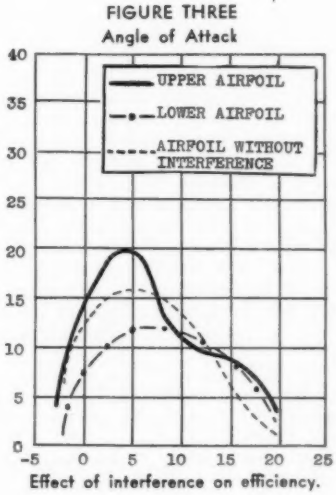
FIGURE FOUR. This shows the comparison between the frontal areas of representative monoplane and biplane types.

FIGURE TWO



Effect of interference on lift coefficient.

FIGURE THREE



Effect of interference on efficiency.

The interference effect can be appreciably diminished by increasing the gap between the upper and lower main plane members, although this arrangement gives rise to rather serious structural problems. Incorporating either a positive or negative stagger in the main plane assembly also tends to decrease the interference factor, at the same time necessitating definite structural modifications.

Wing tip losses represent a particularly derogatory factor inasmuch as they contribute materially to the reduction of overall wing efficiency. These losses can be minimized through the introduction of higher values of aspect ratio, such as may be readily effected with the long, slim wings of the monoplane type of structure. In effect, the approaching air stream, exercising an inherent tendency

to avoid the obstructing wing member, spreads out and flows from under the wing tip in a direction normal to the line of flight. In this manner, a dead area of large proportions is created beneath the trailing edge of the airfoil near the tip. The evil effects of this difficulty can be compensated somewhat by "raking" the wing tips, that is, designing the long dimension, or span, of the main plane member at the trailing edge to exceed that of the leading edge. The biplane structure having four wing tips to the monoplane's two, the problem of tip loss is doubled, everything being equal.

In addition, the introduction of higher values of aspect ratio made possible through the employment of the long, slim monoplane wing progresses considerably toward the solution of the problem of wing tip loss. The inherent tendency for air to spill out from under the tips and be drawn into the area of negative pressure above the upper chambered airfoil surface, thus destroying the suction characteristics thereon for a considerable distance in from the tips, diminishes obviously as the planform of the wing departs further from the dimensions of a true square.

It becomes necessary to incorporate some form of biplane correction in order to compensate for the previously-mentioned mutual interference between superimposed airfoils. Standard methods of correction introduce various means of evaluating the characteristics of a given biplane on the basis of an equivalent monoplane aspect ratio. In general the formula for equivalent monoplane aspect ratio assumes the form of the expression: $\frac{S}{(K\,b)^2}$ where S represents the wing area, b represents the length of the wing span, and K represents a biplane correction coefficient. The coefficient K, in the case of Diehl's method of analysis, represents a factor variable with the gap-to-chord ratio, the ratio of wing spans (in the case of overhang), and the distribution of the wing areas. Munk's method consists in evaluating the characteristics of a biplane cell by correcting the drag of the isolated wing because of additional induced drag, and modifying the angle of attack by the amount of the induced angle of attack for a given lift coefficient and the additional interference angle of attack. Additional methods of correction have been devised to include the analysis of biplane cells incorporating decalage.

From the standpoint of center-of-pressure travel, the conditions affecting both the monoplane and biplane structures are apparently equalized. Aircraft designers seek to combine the two wings of a biplane assembly with different center-of-pressure motions so as to secure a constant center of pressure for the entire cellule. In both types of airplanes, movement of the ailerons tends to introduce an appreciable displacement of the center of pressure.

Overall fineness represents another

(*Continued on page* 94)

The New Ryan S-C

This is the Warner-powered version of the S-C. Note auto-type hood (right).

ADDED to the already-popular Ryan name as an aircraft manufacturer is this newest cabin monoplane that shows promise of filling a void in the current market. Largely a blown-up development of the popular Ryan S-T, the new ship can be had with either a Menasco or Warner engine. Comfortably accommodating three persons, the new ship has a top speed of 150 m.p.h. and a cruising speed of 135 m.p.h. Range is 500 miles. The ship is all-metal.

Some Stowaways!

THERE have been some odd stowaways during the last decade. Some of them have chosen different means of transportation for practising their art. Boats, trains, automobiles, trucks all have served their needs. Needless to say, they have even stowed away on airplanes, and here is one example.

Curly Riggs owned a Ford transport powered with three Wright J-5 motors and anyone who has ever flown one of these planes knows that it is not overpowered when carrying the allowable load. But, when the following accident occurs to you, you'd be non-plussed even as this friend of mine was.

Curly was in Kansas City at the time, barnstorming. Several students from the University came out to the field to see if they could charter the plane from him to carry them to a week-end game the following week and to this end a bargain was struck. The plane was to leave the Kansas City airport on the next Saturday at 10 o'clock in the morning and was to carry 12 students. The Ford had only 12 seats, and therefore was fully loaded.

So, at 9 o'clock on Saturday, Curly inspected the plane and then went in the weather office to check the weather. On returning to the plane, about 15 minutes before departure time, he found the 12 students were in their seats and ready to go.

They had practically no baggage as they were returning after the game, hence, Curly thought the plane to be loaded lightly.

After re-checking everything, he climbed into the cockpit and taxyed out to the run-way to take off. He carefully ran the motors up, read the instruments and then headed the plane into the wind and opened all three throttles.

Down the runway they rolled. They rolled with the throttles wide open and the control wheel all the way forward—but nothing happened. The tail would not leave the ground.

Faster and faster she rolled until she practically had flying speed but the tail could not be induced to leave the ground. When Curly saw that all the field had been used up and they could not take off, he closed the throttles and taxied back to the end of the runway again. On the second attempt he fared no better.

Knowing something to be radically wrong, he took the plane to the hangar.

On opening the door into the tail Curly got the surprise of his life. Packed in the tail end until it could carry no more, were more passengers, more men who wished to see the game. He made them get out and then counted the stowaways. There were 17 student stowaways. Besides the pilot and mechanic, there were 12 passengers and 17 stowaways, exactly 31 in all. No wonder he couldn't get the tail off the ground.

When Curly told the boys that everyone would have been in a bad crash if they had left the ground, they were a frightened bunch. But the fact still remains that there were five more stowaways than there were passengers. A record.

P.S. Only 12 saw the game.

END

The "Buckaroo," a New Sporter

by CONRAD J. MORGAN

Here's something for the fellow who is looking for a new design to work on at home. From the looks of it, this ship should be a humdinger to own and fly.

I was asked to design a high performance biplane for a friend of mine and being the good scout that he is, he has given me permission to pass this snappy little job on to you. He wanted the little ship to be built around the LeBlond 90 with all the speed he could get without sacrificing any of the good qualities of a slower ship. The *Buckaroo* is the result.

Now let's get down to business. The first thing of course was to make a set of three-view drawings that both looked nice and could be suspected of having the high speed that we desired. We chose the NACA 23012 airfoil because it has most of the good qualities of the reliable Clark "Y" but has less drag at high speed. We then made a detailed weight estimate and found that it was not to exceed 810 pounds. We found that 100 feet of wing area would give us a landing speed of 47 m.p.h. which was satisfactory. This allowed us to put 60 sq. ft. in the upper wing and 40 sq. ft. in the lower. The lift and drag coefficients were taken from the full scale wind tunnel curves.

The front view of the ship was then drawn putting in all the details. This drawing must be to scale and accurate as all our dimensions are taken from it. It should be as large as possible for accuracy.

Now that we have an accurate drawing we may list the following:

(a) Power required:

(1) Gross weight = 810 lbs.

(2) Wing area (S) = 100 sq. fr.

(3) Equivalent monoplane aspect ratio:

Upper wing: Span (b_1) = 20 ft.
Area = 60 sq. ft.
Mean chord = 3 ft.

Lower wing: Span (b_2) = 17.1665 ft.
Area = 40 sq. ft.
Mean chord = 2.62 ft.
Mean gap (G) = 2.25 ft.
Mean span,

$$b = \frac{20 + 17.1665}{2} = 18.55 \text{ ft.}$$

$$\text{Ratio of spans, } \frac{b_2}{b_1} = \frac{17.1665}{20} = .856$$

$$\frac{G}{b} = \frac{2.25}{18.55} = .121$$

o (From fig. 2) = .58

Stagger (Measured from quarter point of chord) = 28°

$$\text{E.M.A.R.} = \frac{S}{C_1^2 + 2o\,C_1\,C_2 + C_2^2} = \frac{100}{9 + 9.1 + 6.86} = 4$$

(4) Airfoil N. A. C. A. 23012

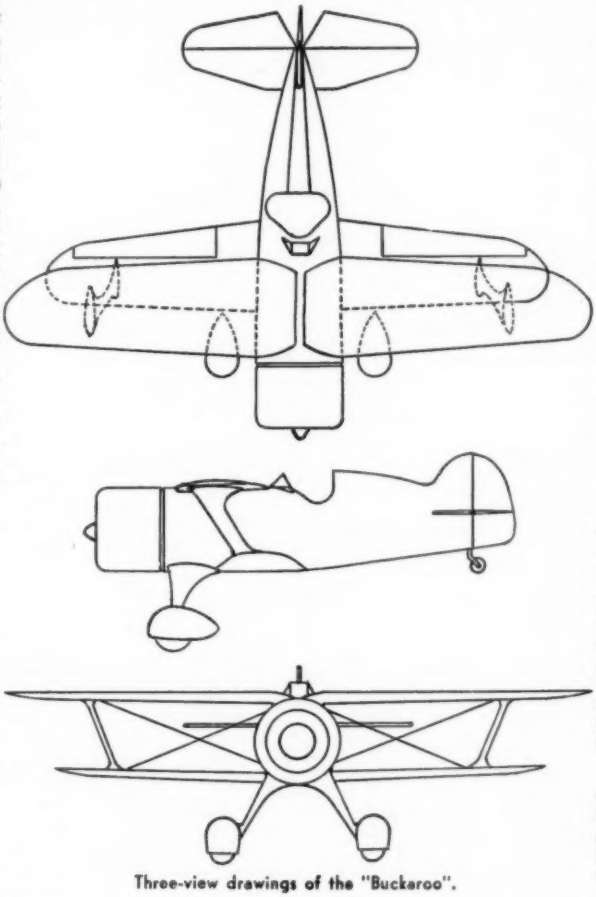
$C_{L\ max.} = 1.4$

$$V_{min.} = \sqrt{\frac{810}{.00255 \times 100 \times 1.4}} = 47.6 \text{ m.p.h.}$$

A table of the resistance of various parts at 100 m.p.h. is given in Fig. 3. The summation of the various drags is given in Fig. 4. It is to be noted that the NACA tunnel cowl and the wheel pants reduce the drag of the fuselage and the wheels by 50 per cent. Cols. 3 and 4, are filled in from measurements taken from the drawing. Then in Col. 5 we have the total cross sectional area or total length of each part. Col. 6 is the drag per square foot or unit length of each part. Col. 7 is the product of Cols. 5 and 6 and is the actual resistance of each part. Notice that the first part of Fig. 4, Summation of structural drag, does not contain the fuselage, tail surfaces nor wheels, they are listed later. Col. 7 is added to give the total structural drag at 100 m.p.h.

Summation of parasite drag P_1, varies with the angle of attach and is shown in the second part of Fig. 4. The fuselage area is taken as the cross sectional area at the largest part, in this case the largest part is at the nose, or tunnel cowl.

Summation of parasite drag P_2, is constant with the angle of attach and contains the wheels and the total of structural drag taken from the first part of Fig. 4.



Three-view drawings of the "Buckaroo".

$\frac{V}{V_{min.}}$	F
1.00	4.00
1.10	1.75
1.20	1.35
1.30	1.20
1.40	1.10
1.50	1.05
1.60	1.02
1.70 and above	1.00

Value of F.

Ratio Shorter span / Longer span	Ratio Gap / Mean span	o
1.00	.08	0.70
1.00	.10	0.65
1.00	.12	0.61
1.00	.14	0.58
1.00	.16	0.55
1.00	.18	0.52
0.90	.08	0.68
0.90	.10	0.64
0.90	.12	0.60
0.90	.14	0.57
0.90	.16	0.54
0.90	.18	0.51
0.80	.08	0.63
0.80	.10	0.60
0.80	.12	0.57
0.80	.14	0.54
0.80	.16	0.51
0.80	.18	0.48

The next step is to find the equivalent flat plate area (A_e) of P_1 and P_2. The equivalent flat area is that size plate that would have the same amount of drag as the ship it represents. So we have:

$$A\ (P_1) = \frac{26.75}{.00327 \times 10{,}000} = .82 \text{ sq. ft.}$$

$$A_e\ (P_2) = \frac{21.29}{.00327 \times 10{,}000} = .65 \text{ sq. ft.}$$

Total $A_e = .82 + .65 = 1.47$ sq. ft.

We now find the coefficients of drag for P_1 and P_2.

$$C_{D_{P_1}} \text{ H. S.} = \frac{26.75 \times 392}{100 \times 10{,}000} = .01048$$

$$C_{D_{P_2}} = \frac{21.29 \times 392}{100 \times 10{,}000} = .00835$$

Thrust horsepower available is found by

multiplying the rated horsepowe (90) by an assumed efficiency of the propeller of 82 per cent. So our thrust horsepower available is $90 \times .82 = 74$ hp.

The table, horsepower required, Fig. 5, is filled from the data available. The factor F, is a factor of parasite increase and is found in Figure 1. The drag of various items is found in Figure 3.

The service ceiling is given by the formula,

$$\frac{\text{ft. per min.} - 100}{\text{ft. per min.}} \times \text{absolute ceiling},$$

$$\frac{2{,}400 - 100}{2{,}400} \times 19{,}300 = 18{,}389 \text{ ft.}$$

Now let's list the results of our calculations and see what we have.

Top speed: 160 m.p.h.
Landing speed: 47 m.p.h.
Absolute ceiling: 19,300 ft.
Service ceiling: 18,389 ft.

Climb per minute: 2,400 ft. per minute.

This concludes the performance characteristics estimate for the Buckaroo.

Figure 2

Item	Drag in pounds at 100 m.p.h.
Flat plate (1 sq. ft.)	32.8
Control horn well streamlined	1.0
Tail skid	2 to 5
Low pressure tire wheel, 22 x 10	9.25
Tail surfaces (per sq. ft.)	4.0
Fuselage, sq. (sq. ft. of area)	6 to 8
Fuselage, round or elliptical (sq. ft. area)	4 to 5
Radiator, free air (sq. ft. area)	15 to 20
Air cooled engines, per cylinder	8 to 10
Streamlined struts (streamlined 1 inch)	0.195 per ft.
Streamlined wires .375 inch	0.150 per ft.
Round tubes, 1½ inch	0.280

HORSEPOWER REQUIRED

V	$\frac{V}{V_{min}}$	C_L	C_{D_i}	C_{D_o}	F	$C_{D_{p_i}} = .01048F$	$C_{D_p} = C_{D_{p_i}} + .00835$	C_D	H. P. req. Sea Level
48	1.00	1.4	.1555	.034	4.0	.04192	.05027	.2397	19
58	1.21	.95	.1445	.012	1.4	.01467	.02302	.17952	24
68	1.42	.685	.0375	.010	1.1	.01152	.01987	.06737	15
78	1.62	.522	.0216	.009	1.0	.01048	.01883	.04943	16
88	1.83	.411	.0134	.008	1.0	.01048	.01883	.04023	16.4
98	2.04	.331	.0087	.006	1.0	.01048	.01883	.03353	21.5
108	2.225	.272	.0079	.006	1.0	.01048	.01883	.03273	28
118	2.45	.227	.0041	.006	1.0	.01048	.01883	.02890	33
128	2.66	.194	.0030	.006	1.0	.01048	.01883	.02733	39
138	2.86	.167	.0022	.006	1.0	.01048	.01883	.02703	48
148	3.08	.144	.0017	.006	1.0	.01048	.01883	.02648	58
158	3.30	.128	.0013	.006	1.0	.01048	.01883	.02613	70
160	3.33	.124	.0012	.006	1.0	.01048	.01883	.02603	73

Figure 5

We find from the table above that the top speed will be 160 m.p.h. We have a difference of one horsepower in that required for top speed and that given by the efficiency formula, this will take care of any error that we might have made in our calculations.

The absolute ceiling H, is given by the formula, $\frac{\text{Max. reserve power}}{3} \times 1{,}000$ which gives us, $\frac{74 - 15}{3} \times 1{,}000 = 19{,}300$ ft

The rate of climb is given by the formula, $\frac{\text{Max. reserve power} \times 33{,}000}{\text{Gross weight}} = \frac{59 \times 33{,}000}{810}$ $= 2{,}400$ ft. per min.

SUMMATION OF STRUCTURAL DRAG AT 100 m.p.h.

(1) Member	(2) Number N	(3) Length L ft.	(4) Size t in.	(5) Total length N X L ft.	(6) Drag/ft. at 100 m.p.h. lb.	(7) Drag at 100 m.p.h. lb.
"I" struts	2	2.25	1.00	4.5	.195	.87
Flying wires	4	6.25	.312	25.0	.150	3.75
Landing wires	2	5.25	.312	10.5	.150	1.58
Landing gear	2	2.5	3.5	5.0	.550	2.75
Fin wires	4	2.25	.250	9.0	.160	1.34
Tail wheel	1	....	....	....	3.000	3.00
Total structural drag at 100 m. p. h.						13.29

SUMMATION OF PARASITE DRAG AT 100 m.p.h.

This varies with angle of attack

Member	Number	Area sq. ft.	Drag per sq. ft. lbs. at 100 m.p.h.	Drag at 100 m.p.h. lbs.
Fuselage	1	8.8	4.0/2 (due to cowl)	17.00
Tail surfaces	..	23.00	.4	8.75
Total parasite drag (P_1)				26.75
Parasite drag constant with angle of attach				
Wheels	2	5 x 4	pants reduce drag 50%	8.00
Structure (First table)				13.29
Total P_2 at 100 m.p.h.				21.29

What a Gas Tank!

Welding a new tank for the Boeing.

THE new Boeing four-engined land and sea airliners now nearing completion in that company's Seattle factory will carry some of the largest gas tanks ever installed in any aircraft. The single tank shown above will carry more than 500 gallons. These fuel tanks are to be installed in the new Boeing flying boat for Pan American and the landplane for TWA.

Birds Join the Navy

THE Navy is having trouble with those big new Consolidated patrol boats that recently flew non-stop from California to Hawaii. But it's not the airplane's fault. It's just that Hawaii's mynah birds have no respect for the dignity of Naval aviation.

You see, those Consolidated boats are the ships that have retractable wing-tip floats. While making their usual rounds, recently, Navy aircraft maintenance crews noticed bits of straw sticking out of the new ships' wing tips. More straw was found back in the tail assemblies. Curious, the sailors investigated and found that the mynah birds apparently thought a little more of the new patrol boats than even the enthusiastic Naval pilots themselves. The birds had moved in.

There were nests in the wing tips, complete even to eggs. While the ships were parked at the Navy's fleet air base at Pearl Harbor, the birds had flown into the wing tip float wells, decided they were home made to order, and proceeded to set up housekeeping.

Now, Navy engineers are pondering on whether—for safety's sake, of course—they will have to cover up the float openings or paint the insides of these tempting hideaways with a foul smelling paint. It probably will be the latter for the paint has been quite successful on airplane-loving rats, mice, cats, etc.

Early Airship Experiences

By ROY A. KNABENSHUE

This authentic story of early balloon experiments is written by one of the earliest airship pilots who, in his day, was as famed as Commander Rosendahl.

NOT so many years ago it was considered idiotic to mention the possibility of flying, but today, commercial aircraft making intercity flights are so common that scarcely anyone takes the trouble to look up as the big noisy craft roars its way across the skies.

Let us look back into the days when men were considered insane when they expressed a belief that they could fly and see how man first was able to get into the air, and later how he was able to successfully fly.

One June 5, 1783, the first public flight demonstration was made by the Mongolfier brothers at Annonay, France, with a hot-air balloon. The vessel reached an altitude of 6,000 feet and traveled a distance of one and one-half miles, a demonstration that startled the world.

Shortly after, Professor Charles made a very necessary improvement, that of prolonged flight through the use of a gas balloon instead of heated air. These men were an inspiration to many successful imitators, some of whom were men of great genius and learning, who blazed trails of aeronautic history, which at the time were considered to be fool-hardy and death defying.

Peter Carnes made the first balloon ascension in America, at Baltimore, Md., on July 17, 1784.

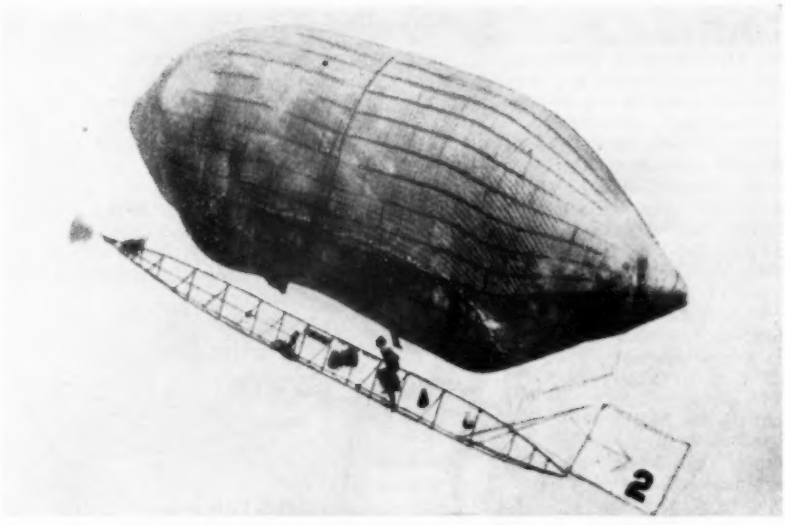
Jean Pierre Blanchard, one of the great pioneers, together with Dr. Jefferies, made an ascent in France on January 7, 1785, crossed the English Channel and, during the flight reached an altitude of seven miles.

Professor John Wise was one of the greatest of American pioneers, a man of great learning, a scientist of exceptional ability, and possessed of daring backed by fundamental knowledge, with a keen sense of humor. He made thousands of ascensions throughout this country without injury to himself and finally died in his bed of old age.

Professor Hogan also left a trail of success in this country, second only to that of Professor Wise. He unfortunately met his death on an ascent from New York City, being blown out over the ocean and drowned before help arrived.

Professor Samuel A. King of Philadelphia was another very successful aeronaut He was very capable, and like John Wise, toured the country making ascents and carried passengers for profit. He made an ascent from Boston with the basket or car, equipped as a dark room and, while over Boston, made a number of photographs on wet plates. He died peacefully in his bed in his eighties.

Professor T. S. C. Lowe of Pasadena, California, was one of our most beloved aeronauts. His experience started long before the Civil War, and he always carried a paid passenger on his ascents. He was in charge of the only balloon owned by the Union Forces during the Civil War. Professor Lowe had under him a young German who was taking instructions who later became famous as the inventor of the rigid airship used so extensively by the Germans during the World War. This was Count Ferdinand von Zeppelin who obtained his initial balloon experience under the tutelage of Professor Lowe.



This old Baldwin airship was built in the era of which Mr. Knabenshue writes. It consists simply of a fabric envelope, fuselage and engine.

There were many others too numerous to mention, but all of these men were subject to suspicion as being lunatics, that the question of making flights through the air was impossible, and any person attempting to do so was surely out of mind.

During the summer of 1881 I witnessed a gas balloon ascension from the State House grounds at Columbus, Ohio, with Professor Hogan as pilot and Sam Flickinger as passenger. This spectacle made a lasting impression on my mind.

The next ascension I witnessed was at Presquisle, a beautiful park located at the mouth of the Maumee River and at the edge of Lake Erie. A Professor Don Carlos was advertised on billboards and in the Toledo, Ohio, newspapers as the feature attraction, and the professor would make daily ascensions and descend by parachute.

This was in the year of 1892, and I made it my business to be on hand every day of the week's engagement and incidentally I made the acquaintance of the professor, and learned that his real name was Flynn. My parents were properly shocked when they learned of my intention to become a professional aeronaut, father's arguments were most impressive, having occurred in the woodshed, but while I was forced to give up the idea for the time being, my secret ambition was to become a balloonist

During the summer of 1897 I visited another professional in Detroit, but unfortunately, the aeronaut was killed in a fall from his balloon, his body crashing through a plank sidewalk. My ambition suffered a relapse and for some time nothing was said further about the matter, until the summer of 1899.

Another professor appeared at the fair grounds at Toledo with a gas balloon on a cable. He was very busy taking passengers up 500 feet for one dollar each and I watched him take in one hundred dollars. That was enough. I then made a bargain with this man to buy his balloon, and during the following winter he shipped the outfit to me.

Naturally, I needed training and knowledge of the art but, being young this matter did not bother me, and during the summer of 1900 I started out with my captive balloon.

My relatives were all against this business. As father was editor of the Toledo *Blade* and the family enjoyed a fine social position, I could not engage in a business that would lower and drag the family name through the mire by association with race-horse gamblers, circus performers and the like. No, sir! It would have to stop. And so, to make it easy for the family I became Professor Don Carlos! At first, I hired several men to assist in setting up the outfit, for this was very hard manual labor. We worked several days before we were ready to begin operations.

We had several days of good weather then, had a sudden hard blow, forcing the balloon down to the ground with the cable

scraping over buildings and trees. Two young men were in the basket, and I became ill over the possible disaster to my passengers, if the cable parted, the balloon would bound up into the altitudes and burst, as at that time we had made no provision for expansion of the gas. Then, again, the possibility of the balloon dashing into a building and breaking their bones or killing them outright.

I was spared this, by the balloon ripping on a lightning rod on a barn. It was all over in a few seconds, which was a relief but very expensive. When we had made the necessary repairs, the engagement for the week was over and we moved on to the next contract

For the next two weeks we had good weather and made money but, on the fourth week it rained most of the time and instead of a profit we actually lost money. On the fifth week, however, we had fine weather and soon forgot about losses.

On the sixth week we had a different story. It was in October, and being cold, sleeping in a tent was not so comfortable. The sky was clear but the wind blew hard most of the time and here again was the possibility of a loss. However, we managed to make our expenses.

We had two men and a girl in the basket on one trip, and the balloon was out to the end of the rope and hanging directly overhead. Suddenly, a gust of wind blew the balloon down in behind the trees where we could not see it. I had two men run over to see if they could make the balloon fast but, by the time they arrived, a telephone pole had ripped it to ribbons, and the possibility of further activities for that season were over.

Carefully considering all the grief of the past, I decided to not operate a captive, but to build small spherical gas-balloons and make free balloon ascensions at the county fairs. During the winter of 1900 I made two balloons of 5,000 cubic feet capacity, or about 23 feet in diameter.

These balloons were made of fine silk, varnished to hold the gas. The basket was supported from a netting which covered the entire balloon, and at the top was a valve which could be opened by pulling a rope which passed through, down and into the basket.

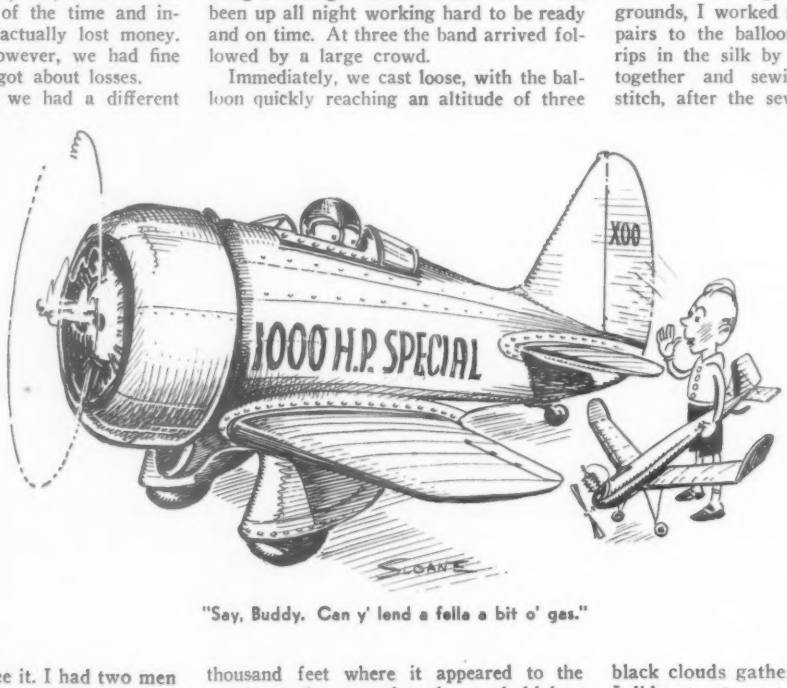
I made contracts for ten engagements each running three days, and I was to be paid $500 for each day, provided I made a free flight, no flight, no pay. Just before starting out for the season one of the silk balloons became scorched, due to spontaneous combustion, and could not be used.

This was a great blow, as we were certain to have to use a second balloon. I decided to try and do without help, and on the first job, I set up alone, we arrived on the grounds at ten in the morning of the day before the first flight.

Hydrogen gas had to be manufactured on the spot as this product was not on the market and, for the purpose, we used four wooden casks with heads, and into these was shoveled cast iron borings, then filled nearly full of water and finally we added sulphuric acid The result was hydrogen gas which was run through water and a lime-box or drier.

Everything was in readiness by two o'clock. The professor dressed in a blue trousers and coat with navy cap was anything but bright and cheerful for he had been up all night working hard to be ready and on time. At three the band arrived followed by a large crowd.

Immediately, we cast loose, with the balloon quickly reaching an altitude of three thousand feet where it appeared to the people on the ground to be much higher. It was drifting with the wind, and we were soon out of sight of the fair grounds.



"Say, Buddy. Can y' lend a fella a bit o' gas."

Pulling on the valve rope, released some of the gas and, in a short time, we were on the ground again without difficulty. A farmer hauled the equipment back to the grounds, and on the way back I was able to get some sleep, stretched out in the bed of the wagon. After two hours of bumping we arrived and then the work had to be done all over, and it was a case of work all night.

About noon on the next day, the balloon was ready again and I secured another two hours sleep in my tent. The band arriving, awakened me; a cold dash of water helped some more, and the professor once again stepped out ready for flight.

This time the wind was blowing briskly, causing the balloon to sway and dip, but the crowd did not know this meant a rough landing and, with the band playing, the next start was made.

This time, we reached a height of but fifteen hundred feet and then started down. We covered ground very rapidly. The trees were bending with the wind and dust was stirred up in many places.

Knowing that a quick landing had to be made, I looked for a sheltered open lot for the purpose, hoping to be able to bring the balloon down just behind a building or some trees.

We were out of luck this time for the balloon struck the cupola of a large barn, ripping it badly on the lightning rods. The basket hit the roof with considerable force, pitching me out and after rolling down the slope of the barn roof I landed head first in a soft manure pile

With the help of the farmer, on whose barn I landed, we secured the outfit and started back to the grounds twenty-five miles distance, and again I slept in the bed of the wagon. On arrival at the grounds, I worked rapidly to make the repairs to the balloon, sewing the tears or rips in the silk by placing the torn edges together and sewing with an overcast stitch, after the sewing was completed, I then smeared balloon varnish on both the inside and outside of the seams.

I felt certain I would not be on time for the next day, and worked continuously all night, to make the gas. By noon I became exhausted and had to sleep, and hired a boy to watch the generators and balloons while I stole a short nap.

By two-thirty we had enough gas to make the ascent, but the balloon was far from full. Suddenly, I noticed black clouds gathering and knew that if I did not get up at once I would lose out on the final five hundred dollars.

Hastily getting permission for the flight and with the band playing a brisk march we made the start, and just as the balloon left the ground a vivid flash of lightning pierced the sky, followed by a crash of thunder that sent everybody hurrying for shelter.

The balloon reached an elevation of 2,000 feet and hung there. I threw out ballast but nothing happened. Then I threw out more and the little vessel commenced to rise slowly, then rapidly. Thunder and lightning became constant now and black clouds surrounded us on all sides. The ground became obscured and the sensation was that of being twisted around and around, pushed from one side to another, causing the basket to swing violently. But the noise was appalling. I could hear the storm ripping along underneath with the crashing as of buildings falling, or trees being uprooted

Finally, it became so dark that it was impossible to see anything except by lightning flashes. Hydrogen gas will ignite

(*Concluded on page* 84)

A Former Aide to Richthofen

By HELEN WATERHOUSE

Once a commander in the Richthofen staffel, Joseph Doerflinger, was consecutively a French army airman and later one of the United States' first airmail pilots.

ROMANCE lurked in the struts of a single-motored plane crossing the straits of Gibralter in the first mail carrying flights ever made.

Romance which zoomed above the Sahara desert when green goggled men flew open cockpit single-seaters through sand storms carrying the mail.

These were brought to Akron, Ohio, by Joseph Doerflinger, one of the first of the world's mail pilots, who later came to this country to make the inaugural mail flight across Lake Michigan and to carry on a route there, before becoming a pilot on other lines about the country.

Doerflinger is a quiet, swarthy, stocky man, speaking English perfectly in spite of his Alsace-Lorraine birthplace. His eyes are keen and he looks older than his forty years—having lived more than most people do in a lifetime.

He has seven children—four future pilots and three future stewardesses—as he laughingly terms them and each was born in a different section of the world.

Doerflinger spanned the Sierra Nevadas in mail planes in the days when there were no safety belts—and no parachutes, and when a "bump" in the air sometimes resulted in a pilot or passenger being "kicked out," or jostled from his seat to his death.

Living as he did in the disputed Alsace-Lorraine territory as a boy, he was drafted into the German army early in the war, entered the air force, and eventually became a commander in the Richthofen squadron.

And then one day came the armistice, and the young commander was told "Go home—Doerflinger—you're a Frenchman now." Soon after he was assigned to the French Fifth Engineering squad in Versailles.

"My job was to guard the chateau where the peace treaty was being signed. I used to laugh to myself as I paraded back and forth there protecting French property when I thought 'If you knew that I had been fighting you for four years——' " said Doerflinger.

Soon after he became an instructor in a French army flying school at Istres. Then at the age of 22, he was assigned to fly the French airmail from Morocco to Gibralter, and thence down to Spain. Later the route was extended to South America. Then for a year and a half he flew the first airmail to be carried across the Sahara.

"Two mail planes always flew together across the desert and we always carried an interpreter aboard," he relates. "This was because of the great danger of capture by desert sheiks if we were forced to make landings in the desert.

Compare Joseph Doerflinger as he appeared on his license in 1918 and as he looks today in the lower picture.

"If we made forced landings, it was just too bad," he adds briefly. "We always burned our planes immediately because we knew they would capture them.

"Two pilot friends of mine were killed on the spot by these desert tribesmen. They always took our guns, and shot their victims with them.

"One pilot did try to take off again when he saw the sheiks approaching after he had been forced down. He gave the ship the gun and headed for the hills, but in his haste he cracked up and was killed anyway. The day I was captured they walked the two of us, my interpreter and myself, to the next Spanish fort, with guns at our backs.

"For months after that I was kept a prisoner by the bandits who swapped me around from one to another, and bartered me off as if I was loot," he said.

"We used to try to persuade the government to let us carry machine guns in our planes. But the company would say: "You are flying the mail. This is peace time—not war time. You must spread peace—Peace.' "

Scraps of stories like that come slowly from Doerflinger who is a modest hero.

Nor does he know how he managed to live through a forced landing on the Mediterranean, 15 miles off the African coast, where he drifted 100 miles in 10 hours in his small amphibian and was finally rescued by a ship.

"The heavy water got in our uncovered motors that day and if we had not carried a few flares, we would have been goners," he said simply.

Superstition which plays such a great part in the lives of many airmen, has no place in Joseph Doerflinger's life.

"There were three of us in that little plane that day—two pilots and a radio operator," he relates. "The others always said our accident was due to carrying three in a plane, which is like 'three on a match' in their belief.

"Though I did have a young brother-in-law killed while flying the Moroccan mail, who had left his fetish at home in a handbag the day he flew," he said, "plenty of those old mail pilots who did that tough flying, carried toy dogs or bears, or even ladies' stockings as 'good luck charms.' "

Eventually Doerflinger came to America on the inspiration of Lindbergh's flight He was assigned to fly the first air mail across Lake Michigan.

"I started flying across the lake in the winter when the temperature was frequently 20 below zero—and the plane was open cockpit," he relates.

He also flew for an early commercial air line between Cleveland and Chicago and a passenger carrying line between Milwaukee and Detroit.

When the airmail cancellation program went into effect, the young Alsatian like many other pilots, found himself without a job, in spite of his over 10,000 hours of flying time.

He has recently gone to Europe to "chauffeur" a plane for a Norwegian fisheries "king"—and will stay there until more thrilling flying jobs offer, he writes.

END

Prize Winner

Herman R. Wenner and his aerial camera.

AN UNUSUAL aerial photo taken by Herman R. Wenner, General Electric incandescent lamp department, Nela Park, Cleveland, while flying at an altitude of approximately 8,000 feet near Spokane, Washington, brought him the "Certificate of Merit" conferred by the Photographers' Association of America.

This photograph, entitled "Viewing the Rockies from Aboard the 'Northwest'" aroused considerable interest at the recent National Photographers convention in Chicago where it was on display.

Taken through a celluloid-covered window and with a "sky-view" aerial camera "stop 5.6 at 1/125th second exposure", Wenner's remarkable shot clearly shows a vast expanse of snow and fir clad sweep of distant mountain range.

Airplanes in Strike

IN this day of one strike after another, many transportation facilities have been indefinitely suspended. Among these were, in brief, Seattle's Puget Sound ferry system. It took the United States Navy, however, to solve what began to look like an embarrassing transportation problem.

For the benefit of those who may not know it, the Navy's big base at Seattle is quite a few miles out in Puget Sound at Bremerton. Until the current strike came along, all Naval transportation usually was confined to the ferry boats. But with the arrival of the strike Naval authorities were left with the alternatives of sailing a destroyer or battlewagon right up to Seattle or . . .

Using their airplanes. That's what they have done. The last we heard the Navy was doing much of its ferrying from Seattle to Bremerton with a Grumman amphibian. And the system was reported to be working out in fine shape.

Climbing Rate Related to Ceiling

by Raoul J. Hoffman

THE service ceiling is defined as the altitude at which the rate of climb is 100 feet per minute. This climb is only an arbitrary selection based on a series of tests which gave the plane a certain controllability for maneuvering and for maintaining the airplane in level flight at a certain speed close to the "minimum power required" speed.

The rate of climb may be assumed to vary linear with change of altitude. That is if, for example, the absolute ceiling is 20,000 feet and the rate of climb at sea level 1,000 f.p.m. for the first minute, then at 10,000 feet the climb will reduce to 500 f.p.m., or at 15,000 feet to 250 f.p.m.

Simple arithmetic shows that there are 20 feet of altitude required for each foot of climb variation or 20,000 divided by 1,000. If 20 feet of altitude is required for one foot then 2,000 feet are required for 100 feet to climb variation. Subtracting 2,000 from 20,000 the service ceiling will be 18,000 feet.

Or, divide the absolute ceiling by the rate of climb at sea level and multiply by 100; then subtract the result from the absolute ceiling to get the service ceiling.

Accompanying chart shows a nomograph which gives instantly the service ceiling if the rate of climb at sea level and the absolute ceiling are known. Draw a line through the absolute ceiling on scale No. 1 and through the rate of climb on scale No. 2, the line will pass through the service ceiling on scale No. 3.

An example indicates the use of the chart.

Bugs Are a Menace

DO you know that bugs can start fires in your airplane?

No, this is not a joke. It's a warning from aeronautical experts of the Aero Insurance Underwriters who know this to be a fact—from expensive experience.

It seems that on a certain type of popular airplane there is a smooth pan beneath the carbureter. The crankcase breather leads to this and, in the bug season, this pan gets loaded with bugs that get stuck in the oil. These bugs in turn act as a sponge and hold whatever oil and gasoline that happens to accumulate in the pan. All that was needed to start a serious fire, then, was a backfire. One owner of this particular type of airplane reported three such fires within a short period.

A Cure for Rustling

WYOMING cattle rustlers have another enemy to cope with these days. Airline pilots operating in that territory have entered into an agreement with the Wyoming Stockmen's Association whereby they will report all suspicious movements of cattle via the plane's two-way radio immediately. Inspectors then will be dispatched to the scene.

Rustlers have been stealing hundreds of head of cattle each week recently despite the determined efforts of ranchers to put a stop to the thievery. The modern rustlers load the cattle aboard high-speed trucks at night and whisk them away to dispose of them the next day hundreds of miles from the point where they were stolen. Now the airline pilots will keep their weather eyes peeled for these trucks.

Aeronautical Odds and Ends

There are many little scraps of adventure and human interest taking place in aviation every day. Most of these we never hear about. Here are a few tidbits.

ONE club that is destined to have an ever-increasing membership is the Caterpillar Club. Despite newer and safer designs in aircraft, the parachute continues in its role of the airman's life saver. It is a good sight to see the continued increase of the parachute by civilian airmen. The following paragraphs account for a few of the many lives that have been saved by parachutes last year and show the wisdom of having the silken umbrella handy.

The parachute was opened at 5,000 feet. The plane hit the ground at about the same time. Eyre sat in the harness slightly dazed and wondering what had happened to his observer. Upon looking up, he saw the observer safely descending in his parachute about 4,000 feet above.

After narrowly missing a tree, he landed on a carpet of pine needles in a heap, sore and scratched, but safe.

* * *

A MARTIN bomber making a routine flight on June 6, had young Cadet Bailey at the controls. Staff Sergt. Smith was the observer. The stories vary; some say Bailey tried to stunt, some that the plane fell into a spin.

At any rate the plane was spinning in a flat spin, when Bailey yelled, "Get the hell outa here." Smith "got." He went over the side at 7,000 feet. Bailey bravely struggled with the falling ship as it fell another 5,000 feet. Then he "got" also. Both made safe landings.

* * *

THE Bendix Trophy race saw the initiation of Joe Jacobson into the Caterpillar Club. While flying a Northrop *Gamma* owned by Gar Wood, he awoke and found himself in mid-air. Pieces of the ship were falling around him. He immediately operated the parachute and made a landing. On the ground he could only find a foot of the wing tip.

What had happened was that the plane had exploded and flung him clear. He felt as if a hammer had hit him. He awoke amid the falling debris.

* * *

AND so the cycle continues. Planes fail. Pilots find themselves in mid-air. Engines conk out. A stunting plane has a wing fold up.

Engineers think and plot. Stress analysis upon formula are written and figured. Newer and safer planes are built. Daring test pilots throw transport planes around the sky like snappy pursuit jobs.

But the inevitable happens. It may be the so-called "human element," or some other reason. A figure beneath a silken mushroom watches a wreck hit the ground, and says to himself, "Thank God, I'm a Caterpillar."

* * *

IT was a close call and proves that danger can often come from where one least expects it. Certainly one would not expect to find it in the form of a hornet's nest in the fuselage of an airplane, but that is exactly where these belligerent insects once built their home in an Army plane.

When its pilot was at 2,000 feet, they suddenly attacked him in battle formation. He was at a loss to know where the pests were coming from and attempted to dive away from the swarm. That only aroused them to increased activity. The stings were agonizing and it took a lot of will power to keep from taking French leave of that hot seat. He stuck with the ship, however, and brought it down safely, but for the next few days the contours of his face bore a striking resemblance to a cauliflower.

* * *

PERHAPS the most trying situation of all was that of a high altitude pilot who had a fly inside his face mask. The fly kept crawling around his nose and the tickling was almost unbearable. He was at an altitude where to have removed the mask would have meant instant unconsciousness, so he just had to endure it. His brother officers consider him one of the unsung martyrs of aviation.

* * *

PLANE captains in Hawaii have unusual troubles. A member of the same squadron that narrowly escaped the bean barrage was making landings in the West Loch when a fish jumped clear of the water, was caught in the powerful propeller slipstream, and thrown violently against his head. At that speed it felt like a brick and knocked the unlucky airman cold.

* * *

A FEW years ago there was a well-known civilian flyer around the Nation's capital who had a decided taste for feminine society. He was always bringing some fair lass out to the field for a hop. One day he was upstairs with one of them, rocking along nicely in the calm afternoon air, when suddenly his engine petered out. He just did make the airport.

His gauge showed that he had plenty of gas and the mechanics could find nothing wrong with the engine. After a little cranking, it started up again. Once more he took off with his lady. Just as they were clearing the treetops bordering the field, the engine balked a second time and left the pilot in a most embarrassing position.

It looked like a bad crack-up for a second, but he managed to squeeze between two houses and pancake into a little vacant lot. Again mechanics examined the engine and could find nothing wrong.

They were in a quandary to understand the trouble. Then one of them spied a wad of chewing gum on the gas tank cap. The girl had stuck it there when she climbed into the plane, and it had stopped up the air jet. Of course as the gas was used up it created a vacuum in the tank and eventually stopped the flow.

* * *

MOST exciting of all, perhaps, was a ride with Alexander Seversky when he broke that amphibian speed record. He nicked off 230 m.p.h. plus over a three kilometer course after which the job was for him to land in the Detroit River to demonstrate the amphibious qualities of his sleek plane. The ship, his mechanic admitted, had never been on the water with the 715 h.p. motor. The landing was perfect. The take-off was, too, for that matter, but Seversky later admitted that he had difficulty taking off. His parachute had slid forward between his legs and prevented him from pulling the stick back beyond the neutral point. Calmly Seversky rolled back the stabilizer and took off. Great presence of mind, I thought, but Seversky treated the incident only casually. . . .

* * *

THE world war continues as one of the richest fields of drama available to motion pictures and this means that 1914-18 model airplanes are needed from time to time.

Garland Lincoln, war-time American pilot, keeps an assortment of old airplanes at the Metropolitan airport, including "Spads", Fokkers, and French Nieuports. He also has some modern airplanes which he rebuilds to resemble war-time fighters.

Another Vacuplane Appears

The duo-lift vacuplane combining wing and cellular lift.

One of the most unusual types of modern planes—unusual to the point of freakishness.

LANIER'S Vacuplane is not, strictly speaking, a new idea for the preliminary description of the first Vacuplane appeared in the October, 1931, issue of POPULAR AVIATION.

However, it has gone through a prolonged development with many detail changes and corresponding improvements in performance. The basic principle, however, remains the same for the lift of the normal wing surfaces is still augmented by the peculiar cells placed along the body at the root of the wings.

By this combination of lifting effect, the machine is made unusually compact, small in span and length, and at the same time, the inherent stability is improved with a landing speed below the normal landing speed of the conventional airplane.

Are You Building a Lightplane?

by M. H. CARRINGTON

Here is some invaluable dope for the fellow who's doing a job of airplane building himself. There are a great many construction tips here for the amateur.

AT the present time, due to the engines used and to good structural design, most of the lightplanes built are capable of safe flight.

However, in examining the general trend of design it will be found that simplicity of construction is aimed at rather than performance, in most cases. To a certain extent this is commendable, but here are several points or suggestions, not commonly found, which if followed would add to the "flyability" of a ship without entailing an undue amount of labor in building.

Nowadays, one has to go far and wide to find the raked wing tips of a few years ago. We all know that they are aero-dynamically poor, due to high uneven air loads, and hard to brace, and that even square tips are bad. Yet, you see builders blithely putting these same shapes in their tail surfaces. (Fig. 1)

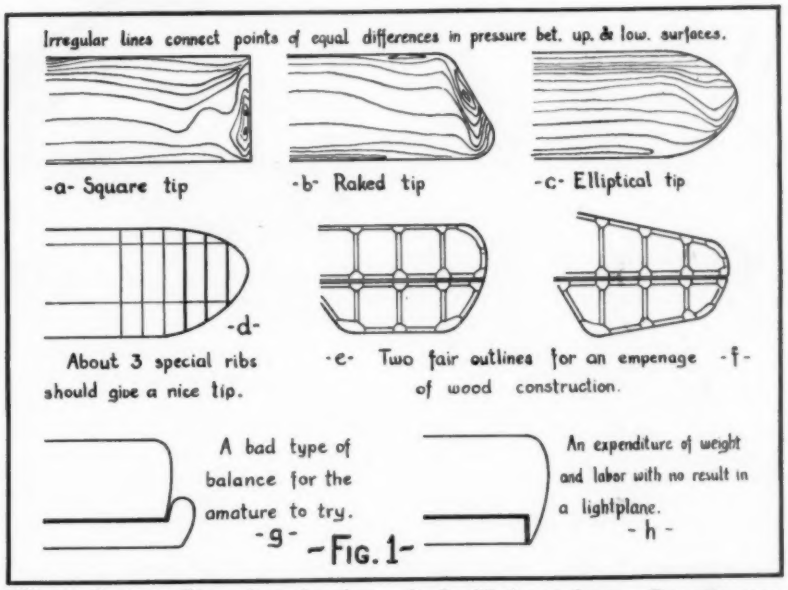
The ideal platform for any tip is an ellipse. Of course, while the air loads on the rudder are not so high, the same principal holds true. In the wing tips this form can usually be had at the expense of making two or three extra ribs. If the tail surfaces are constructed of steel tubing, as is the case a great many times, making them elliptical will give no extra work to speak of. If they are of wood this is naturally a difficult shape it attain and the best bet is probably a square or triangular form.

While speaking of wing tips, avoid overhanging aileron balances (Fig. 1-f) or insets (Fig. 1-g), as the first gives unusual loads that should be engineered and there is really no reason to use the second on a lightplane.

Raising the horizontal tail surfaces high on the fin causes the rudder to be blanketed less in a stall. This gives better directional control in that condition, and gives less interference between them and the fuselage. It also keeps them clear when taxying in tall grass. Considerable thought is needed, though, from the structural standpoint to make this sort of empenage sturdy.

On a fast ship, a large cockpit opening will detract as much as five miles an hour from the speed. Your plane probably won't be that fast, but why make the cockpit and windshield like an open roadster?

Taking everything into consideration, the monoplane seems to win out over the biplane in the lightplane field, but the general trend is to brace a monoplane wing with struts. If wire is used for this purpose the weight will be greatly reduced, and if your pocketbook will stand streamline wire, the drag will be reduced to a small fraction.


Irregular lines connect points of equal differences in pressure bet. up. & low. surfaces.
-a- Square tip
-b- Raked tip
-c- Elliptical tip
-d-
About 3 special ribs should give a nice tip.
-e- Two fair outlines for an empenage of wood construction.
-f-
A bad type of balance for the amature to try.
-g-
An expenditure of weight and labor with no result in a lightplane.
-h-
-FIG. 1-

However, wire bracing is trickier to align and some peelots can't stand the strain of looking out and seeing those "flimsy" guys. A high-wing or parasol job gives a far greater insurance of stability than a low or midwing, while a biplane should not be attempted unless there is an engine of good horsepower available. If a cabane is used, the type that converges over the fuselage with no center section will be easier to make and rig, and will save weight.

Another weight saver that is not very commonly used is the triangular fuselage. This eliminates one upper longeron, the top cross-struts and braces, and the internal braces back of the cockpit.

Single-strut landing gears, such as are being put on the latest military jobs, cut down resistance in a place that needs it badly, but probably don't save weight and ought to have some stress-analysis. On slow and medium speed ships of the lightplane type wheel cowlings or pants as they are called, aren't worth their salt, as they catch mud, grass, etc.

But, if you can get a pair of the new low pressure streamline wheels you are in luck. On the conventional type of structure, covering in the fore-and-aft gap between the struts is a very good idea. Don't leave the spokes of wire wheels exposed, as this adds greatly to the drag.

An uncowled engine gives more drag than is generally supposed, and some bent and hammered aluminum around it should do no harm. Be very careful, though, that an aircooled engine does not overheat, as it will if the cowling is too complete.

Where it is consistent with good judgment, every exposed strut, gimmick and doohicky ought to have a wedge shaped piece of balsa streamlining fastened to its rear. The additional five pounds of weight in putting bulkheads and fairing strips around the fuselage should be well worth it in most cases.

One place where the temptation to save weight should be resisted, is in building short fuselages and small tail surfaces. On high speed jobs with plenty of air flowing over them, it is bad enough, but on slow jobs use a lot of area and lever-arm.

The more completely a plane is streamlined, the greater will be its tendency to "float" or glide flatter than it would have otherwise, because the ratio of lift to drag (L/D) is greater. In this case, flaps might be profitably employed to make the angle of approach steeper, and the landing speed less. Otherwise the old barnstorming practice of fishtailing might have to be resorted to in order to get into a small field.

Bulletin 7-A of the Bureau of Aeronautics, Airworthiness Requirements for Aircraft (which gives the requirements a plane must fulfill to obtain a license) will be found to contain a great deal of valuable material, even though you never intend to have your ship licensed.

END.

A Gas Powered Model Monocoupe

By

PAUL W. LINDBERG

POPULAR AVIATION Model Editor.

Here is the completed model. This ship is an exact reproduction of its air-going big brother even to cowling, wing-panel window and paint job.

WE are quite sure all model builders are familiar with this popular name. This model is absolutely the last word in high performing gas models. Its trim racy lines, colored in blue trimmed with silver, makes it an outstanding model both in performance and beauty.

If the plans are carefully followed no difficulty will be encountered in constructing this model. By enlarging the plans five times the size shown in the magazine, the model will be exactly to scale as mentioned in drawing. This may be easily accomplished with a pair of dividers and a ruler.

Construction of Fuselage

The main longerons are of basswood, all other parts are of balsa. Place wax paper over the plan to prevent the fuselage sides from sticking to the drawing. Please note that it is very important when cementing the two sides together that great care be taken so as not to crack the main longerons, where they curve to form the cabin. One-half inch No. 18 nails are driven through the longerons into the uprights and cross members of the fuselage with the exception of the section which forms the cabin.

From 1/8 inch sheet balsa, cut the formers and cement them in their proper locations. The 1/8 inch by 1/16 inch stringers are attached and spaced evenly about the formers, as shown in the front and side view of plan. Photo of the framework clearly shows the pieces of body which are covered with thin cardboard and aluminum, one-eighth inch balsa ribs are attached to the top sides of fuselage (see side view of plan). After all cross pieces have been inserted in top of fuselage, 1/16 inch drilled dowels are cemented in and bound with heavy thread. These are installed to receive shear pins which hold wings in position at cabin.

Removable hatch is installed in top of cabin. This is necessary in order that the batteries may be shifted on the slide in order to balance the model as well as to check up on any ignition trouble, if such should develop. A 1/16 inch three-ply veneer firewall is attached to the front of the fuselage. Drive nails through veneer and into longerons so that it will hold fast. The motor mount is made from 3/4 inch 1/2 inch hard aluminum or 1/32 inch soft steel.

Construction of Landing Gear

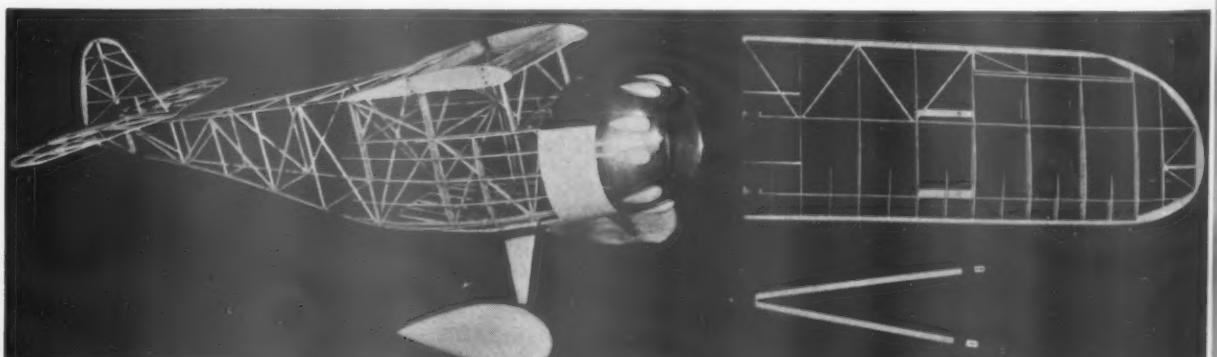
The type of landing gear used on this model is simple to construct. It consists of two pieces of 1/8 inch spring tempered steel wire. The front piece forms the axles for the wheels and continues up into the fuselage. The rear wire is bound to the front wire and continues up and across the bottom of fuselage.

Fill in the space between the 1/8 inch landing gear rods with sheet balsa. A piece of 1/8 inch thick is used at the center with a piece of 1/16 inch balsa on either side so as to fill out the struts. After this has been completed, cover complete strut with bamboo paper. This will add to the strength. Fill in bottom of strut with balsa, where it connects with pants. A little patience is required here as this will have to be fitted and shaped in order to obtain a finished effect. The wheel pants are described on the plan and are used for display purposes only, do not fly model with wheel pants on.

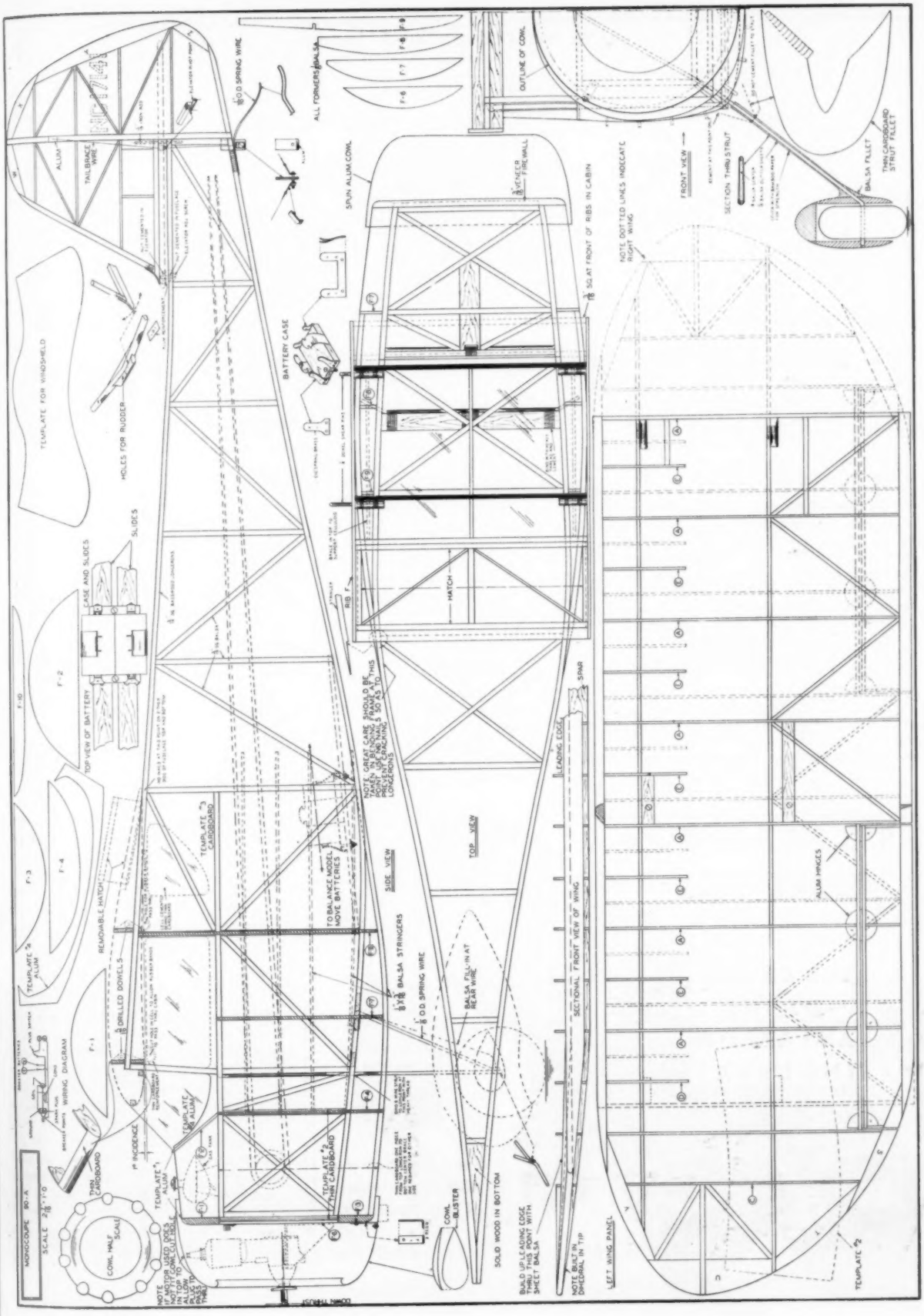
Construction of Elevator and Rudder

The construction of the elevator and rudder is very simple as both are built to the front section, 3/16 inch in thickness. Construct upon a flat surface so that they will not have a tendency to warp. The elevator is adjustable by means of an adjustment screw located at the center of the leading edge. Lock nuts may be applied here after the proper setting is had. The rudder adjustment is very sim-

(*Continued on page 70*)

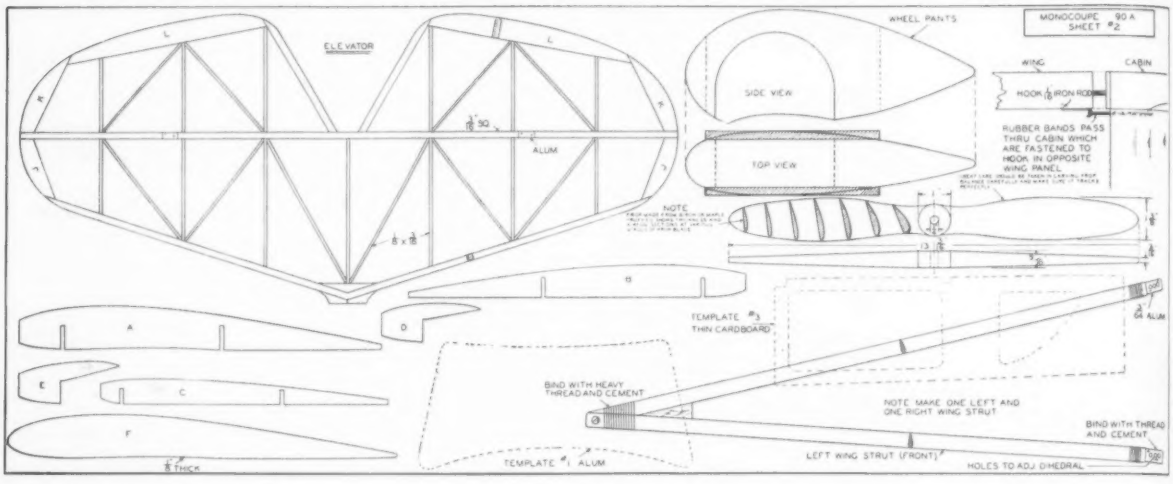


With typical Lindberg cleanliness and minute detail, POPULAR AVIATION's Monocoupe gas model follows a full-size airplane construction job faithfully. Above is the uncovered gas model.


MONOCOUPE 90-A
SCALE 2⅛"=1'0
TEMPLATE FOR WINDSHIELD
HOLES FOR RUDDER
SLIDES
CASE AND SLIDES
TOP VIEW OF BATTERY
REMOVABLE HATCH
DRILLED DOWELS
WIRING DIAGRAM
TEMPLATE #1 ALUM
TEMPLATE #2 CARDBOARD
TEMPLATE #3 CARDBOARD
TEMPLATE #4 ALUM
THIN CARDBOARD
COWL HALF SCALE
NOTE IF MOTOR USED DOES NOT EXTEND THRU COWL SEE THAT IT IS SET IN TOP TO ALLOW FOR PASSAGE OF PROP
DOWN THRUST
TAIL BRACE WIRE
ALUM
ALL FORMERS BALSA
8 O.D. SPRING WIRE
SPUN ALUM COWL
BATTERY CASE
RIB F
HATCH
TO BALANCE MODEL MOVE BATTERIES
NOTE GREAT CARE SHOULD BE TAKEN IN BENDING FRAME AT THIS POINT SO AS TO PREVENT CRACKING LONGERONS
SIDE VIEW
TOP VIEW
⅛"x⅛" BALSA STRINGERS
8 O.D. SPRING WIRE
BALSA FILL-IN AT REAR WING
SOLID WOOD IN BOTTOM
BUILD UP LEADING EDGE WITH BALSA AND SHEET BALSA
COWL BLISTER
NOTE BUILT IN DIHEDRAL ON TIP
SECTIONAL FRONT VIEW OF WING
LEADING EDGE
SPAR
LEFT WING PANEL
TEMPLATE #5
ALUM HINGES
SG AT FRONT OF RIBS IN CABIN
NOTE DOTTED LINES INDICATE RIGHT WING
OUTLINE OF COWL
FRONT VIEW
SECTION THRU STRUT
BALSA FILLET
THIN CARDBOARD STRUT FILLET

The Monocoupe 90-A Model

(*Continued from page 68*)



ple and is clearly explained in details found on the plans.

Construction of Wing Panels

All ribs are cut from $\frac{3}{32}$ inch sheet balsa. Spars, leading and trailing edge then are cemented into place. Do not omit any of the bracing between the ribs, as this is necessary to strengthen them. Five-sixteenths inch dowels are cemented to spars at the root of wings. The wings carry moveable ailerons, which are a great help when flying the model, as a small amount of wash-in is necessary to counteract propeller torque.

The entire model is covered with a good grade of bamboo paper. In applying the paper to the framework, ordinary model airplane dope will not do.

Ordinary cement, thinned out slightly, makes excellent paper cement. In order to obtain a nice covering job, see that practically all wrinkles are removed.

Do not stretch the paper so tightly over the frame that it will have a tendency to pull out of shape. After the various parts have been covered dope with water. This will cause the paper to tighten over the framework. If the brush is used, extra precautions should be taken so as not to tear paper.

Any small spraying device is an excellent means of applying the water. After the pieces have become thoroughly dry, clear dope them. To obtain a smooth finish, a light sanding is given between each coat. To finish off the model, color coats are applied. Color used on this model is blue trimmed in silver.

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Test House

(*Continued from page 54*)

operation of large propellers without the usual wall interference encountered when propellers rotate in houses of square sections. The engine test chamber can be cut off from the outside air by lowering two electrically operated heavy canvas curtains, and the engine chamber rapidly heats up to a comfortable temperature when installing or removing an engine. A working platform supported from the suspension cables is permanently installed on each stand, and telescoping portion of this platform can be extended forward and around the engine when it is stopped for adjustments.

The carburetor air is taken in from the roof and led down through large ducts just outside the ends of the control room, and thence through air temperature regulators to the engines. Provision has been made to measure the quantity of air used by each engine, by the use of a system of calibrated orifices. Air to the propellers enters the intake stacks at the corners of the building, and after leaving the engine passes through a series of heavy steel baffles installed in the entrance to the exhaust stacks to improve cooling air flow conditions, and thence out the stacks. The exhaust stacks themselves, which in former designs of test houses are placed back to back with a common wall, have in this case sloping walls which form an A-shaped space between the two stacks. Stairways located in these A-shaped spaces connect the control room with the lower floor, and small observation windows in the sloping walls which are accessible from the stairway enable an observer to view the exhaust from all engine cylinders.

END

THE CUB SPEAKS:

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The Cub speaks to you as well as to thousands upon thousands of prospective Cub owners. 1938 will be a happy year for airplane dealers who are properly organized and equipped to benefit from

69,682,320 CUB MESSAGES

That's right—69,682,320 Cub messages! The largest advertising campaign ever run by any airplane manufacturer. Monthly and bi-monthly schedules—all-size advertisements including full pages—in leading national and aviation magazines—Saturday Evening Post, Collier's, Life, Time, Country Gentleman, Esquire, Field and Stream, Outdoor Life, Popular Mechanics, Pópular Science, Aero Digest, Aviation, Popular Aviation, Sportsman Pilot, Western Flying, The Pilot, Southern Flight, American Aviation and others.

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THIS will be a happy year for thousands who have wanted to own and fly their own planes. For Cub—now geared in its new plant to produce more ships in 1938 than all commercial airplanes built in 1937—makes it possible for you to own your own new airplane and learn to fly without paying a cent for dual instruction.

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That's it in a nutshell! "Get a Cub and learn to fly!" Learn to fly in a plane that, because of its inherent stability, dependability, ease of operation, and amazing economy, has become the first choice of private owners as well as of instructors.

ONLY $425 DOWN

You can now own a new 1938 Cub plane—just announced—for only $425 down and easy monthly payments (lists at $1270 F.A.F. factory)—an extremely low cost because the Cub is the world's fastest selling airplane. And it is so economical to operate that owners average more than 25 miles to a gallon of gas and 350 miles to a quart of oil!

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FREE!

We shall be glad to mail you full details on the free flying course; also free Cub illustrated folder and name of your Cub dealer. Paste coupon at right on penny post card, if you wish. Piper Aircraft Corp., 28 Aviation Street, Lock Haven, Pa., U.S.A.

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28 Aviation St., Lock Haven, Pa.

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COUNT THE CUBS

THE WORLD'S FASTEST SELLING AIRPLANE

Bristol—From Box-Kite to Blenheim

(*Continued from page 42*)

was built. Made primarily as a general purpose machine, it was really a much larger edition of the *Bulldog*.

Of course, almost as a matter of routine, another modernized fighter was built. This was the "101", a two-place fighter with a 450 h.p. *Jupiter* fitted with an exhaust ring and a silencer.

In the following years Bristol turned out modified versions of the *Bulldog* fitted with improved and bigger engines. One, the "123", was made as a four-gun day-and-night fighter and was powered with a Rolls Royce *Goshawk* engine while another had a Napier *Dagger* and was used in full scale wind tunnel tests. The *Bullpup* was made after the same design but was smaller and lighter and had N outerplane struts.

Work progressed in the engine department and three light engines were developed. These were the *Lucifer* three—the Titan five—and the Neptune seven-cylinder engines.

A new series, the *Pegasus*, was introduced in 1932. Today, due to continuous refinement, this powerplant is easily the outstanding radial aircooled engine in Great Britain. It is also made under license in many foreign countries. A very similar type, the *Mercury*, with the same number of cylinders but with a shorter stroke, was made for military purposes. The most notable installation of *Mercuries* is in the *Blenheim* medium bomber.

This success was continued when, in 1933, another new engine was made public. It was the *Phoenix*, a compression ignition or Diesel radial air-cooled engine. Development work on this powerplant amounted to seven years. Done for the Air Ministry, five of the seven years had been expended on research on single cylinder units which included 1,500 hours running on various types of cylinders. It was a nine-cylinder engine of 400 horsepower and the active service tests were carried out on a Westland *Wapiti* general purpose machine.

Although a lot of work was spent on continuing development of these new engines, aircraft production went right on. A new general purpose biplane called the "120", was produced. The powerplant was a *Pegasus* engine and the plane incorporated a feature now considered common on modern multi-place military aircraft. This was a transport cupola over the rear cockpit to protect the gunner from the slipstream while maneuvering his guns.

Following this came another revolutionary craft. Known only as the "133", this was a low-wing, all-metal stressed skin monoplane with a covered cockpit, flaps and a retractable landing gear. With a Bristol *Mercury VI. S. 2* engine it had a very high performance but even then the Air Ministry officials regarded it with suspicion because of its design. The biplane still reigned in His Majesty's air force and anything without a lot of struts and wires had two strikes on it before it even went to bat. The climax came when the craft met with an accident and was badly damaged. A second chance was refused. Not with only one biplane in production, the noteworthy Gloster *Gladiator* (*Mercury*), the R.A.F. must realize their error.

During this period another type of aero-engine was being developed of the sleeve-valve type. The *Aquila* was made as the commercial version and lately the *Perseus* has been produced for military use. The latest development is the *Hercules*, a 14-cylinder radial sleeve valve engine giving 1,100/1,150 h.p. This engine has been specially designed to take advantage of the 100 octane fuels now available for even higher performance. Tests have shown that this new fuel will improve h.p. output from 15 to 20 per cent and at least 5 per cent better engine economy. The sleeve valve engine is very much simpler in construction than the regular aero-engine employing poppet valves. This is graphically shown by the fact that the former has only 50 parts while the latter needs about 150.

The engine department of the Bristol Aeroplane Company is one of the most—if not the most—complete of its kind in the world. It certainly is one of the largest. There are innumerable machines for engine testing in all its forms and also for engine components and the materials that go into engine construction. Every possible punishment is given to bring out the possible weaknesses of any material selected for inclusion in Bristol engines.

Under the new British expansion program, the Bristol company has been forced to enlarge its present facilities to be able to cope successfully with the orders that came pouring in for their aircraft and motors.

Just before the expansion, Bristol had designed an entirely new ten-place, low wing all metal monoplane fitted with two *Aquila* sleeve-valve engines for commercial use. At almost the same time, Lord Rothermere requested an ultra-high speed airplane for his private use. This was amply filled by the *Britain First* or "142". When Lord Rothermere had the "142" sent to Martlesham for its certificate of airworthiness (similar to our approved type certificate), it revealed such astounding performance characteristics that the Air Ministry asked for a loan of the ship for development purposes. This resulted in the *Blenheim* or "142M", acknowledged to be one of the fastest medium bombers in service today. The *Blenheim* is slightly different from the prototype. The changes including fitting *Mercury VIII* engines of 840 h.p. each, raising the wing (it now is a mid-wing), to enable the installation of bomb racks. The conservative top speed is 279 m.p.h. at 15,000 feet and the climb is 1,360 f.p.m. with a ceiling of 30,000 feet.

Retractable landing gear and controllable-pitch props are also featured. The delivery works out so that one in ten are fitted with dual controls in the nose. Orders are also booked for Turkey and Finland. Production on the "143", a commercial version of the *Blenheim* is being held up until all the bombers have been delivered.

Another military model is the *Bombay* (two 960 h.p. *Pegasus*), a bomber-troop-carrier intended for use in the British colonies. Due to Air Ministry policy, these are being manufactured by Short & Harland, Belfast, under the "shadow scheme". They are high-wing monoplanes with a fixed landing gear and no other external bracing. A crew of four is carried as a bomber and three plus 24 fully armed soldiers when used as a trooper.

A type developed purely for experimental purposes is the "138A", a low-wing all wood monoplane used by the R.A.F. for high

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Bristol

(*Continued from page 72*)

altitude research. Various engines have been fitted but when it recaptured the altitude record from Italy, it was powered with a *Pegasus* P.E. VI.S engine fitted with a two-stage supercharger. The record was to 53,937 feet. The previous record made by Col. Pezzi of Italy was 51,362 feet.

A little while ago this concern took another step in manufacturing. Feeling that the controllable-pitch propeller was not being developed rapidly enough, Bristol formed a partnership with Rolls Royce in order to make their own propellers. The company thus formed is known as Rotol Airscrews Limited. Hydraulically controllable-pitch propellers incorporating the constant speed mechanism will be manufactured, the first model already having passed its tests.

The engine division recently came out with two new models of the already famous *Pegasus* and *Mercury* engines. The *Pegasus XVIII* is fitted with a two-speed supercharger and gives 800 h.p. mediumly supercharged and 855 h.p. fully supercharged. This engine will be seen soon on several new military aircraft undergoing test trials. The *Mercury* is mediumly supercharged and has a power rating of from 790 to 890 h.p. at various altitudes. The many other models of each type are being turned out as fast as is advisable.

In the Bristol works a large sign is conspicuously displayed, "Quality must be the best". For almost three decades Bristol has been guided by this motto. The legion of designs including *Box Kites, Fighters, Bulldogs, Bombays, Blenheims* and *Jupiter, Mercury* and *Pegasus* engines; they have met the test and passed out to bring the highest renown for their builders. Stressed skin construction, retractable landing gear, cowled engines, the sleeve valve engine; these and many more have emerged from under these roofs to improve the breed and have left their mark on the industry. The trials of those early days only served to urge their creators on.

Bristol is an excellent example of that.

Box Kite*		Blenheim*
Ash and spruce, cotton covered.	Construction..	All metal, stressed skin.
34 feet.....	Span.....	56 feet, 6 in.
35 feet.....	Length.....	39 feet, 9 in.
1,000 lb.....	Weight.....	11,776 lb.
3.....	Crew.....	3
Gnome rotary (1)	Power plant...	Bristol *Mercury* (2)
50 h.p.....	Horsepower...	1,680 h.p.
37 m.p.h.....	Max. speed...	280 m.p.h.
50 miles.....	Range.....	1,000 miles

*Both are military airplanes used by the R.A.F. The *Box Kite* was the first and the *Blenheim* is the latest Bristol design.

END

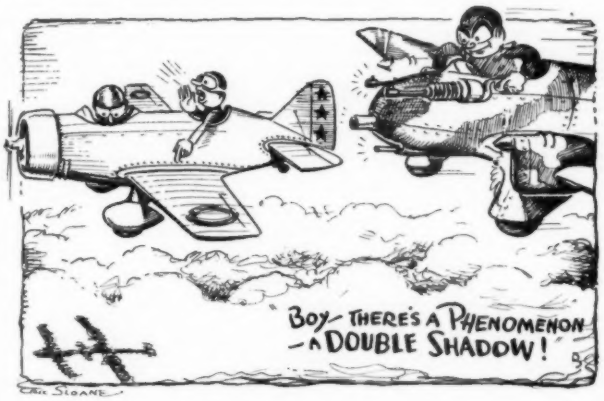
Over the Atlantic With Wellman

(*Continued from page 34*)

A motorboat towed the airship through the breakers and out to sea. The great dark bag against the leaden sky looked like some fantastic fish as she drifted at the end of her cable. When the breakers had been passed, the equilibrator was lowered into position, the engines started, the motorboat cast off, and the airship proceeded on her course for Europe.

The weather was calm and foggy, with scarcely a breath of air stirring. At first the ship was able to make a speed of 15 knots per hour, but it was not long before engine trouble developed. Sand had worked its way into the bearings during the preparation at Atlantic City and it soon became necessary to stop both engines.

Repairs were hastily made and the powerplants were soon once more in operation, but the trouble could ont be eliminated. Several times it became necessary to stop one or both of the engines, and during such times the ship drifted, moved only by the wind.



By evening the airship had covered about 150 miles to the northeastward That night, while flying low above the waves, she just missed colliding with the masts of a schooner. The cool night air contracted the hydrogen and the bag dropped dangerously close to the water. A large amount of gasoline was dumped to keep the craft afloat.

On Sunday, the second day out, one of the engines broke down so completely as to make it useless. It was taken apart and tossed overboard as ballast. That night the wind changed to the northwest and rapidly drifted the *America* off her course.

On Monday morning, the third day of the flight, the sun came up extremely hot and expanded the gas to such an extent that the airship rose up nearly three quarters of a mile before it could be checked. So much hydrogen was valved in returning to a lower level, that this fact, together with the previous jettisoning of gasoline and the loss of one engine, made the crew realize that they would never reach Europe.

An examination of the hydrogen and fuel supply told them that they could only stay in the air one more day. That night, every disposable object had to be thrown overboard to keep the *America* from settling into the sea.

Early Tuesday morning a ship was sighted. She was the *S.S. Trent,* bound from Bermuda to New York, and Irwin lost no time in tapping out a stand-by signal, for it was evident that the *America* could not stay aloft much longer. The *Trent* changed her course and followed the airship, which was drifting helplessly with the wind at about 15 miles per hour.

Fortunately, the *America* carried a well-equipped lifeboat suspended beneath the car for use in case of an emergency landing at sea. The crew crawled reluctantly into the boat and brought the airship close to the surface of the waves.

Here they operated the trips that dropped the boat into the water. As soon as the airship was relieved of their weight, it shot upward and soon faded from sight. The crew rowed the lifeboat to the *Trent* and were taken aboard.

The dirigible was in the air 72 hours. Although she covered 1008 miles, she made only 250 miles of her course to Europe. The wind had driven her southward when she became disabled and she was near Norfolk, Virginia, when the crew was picked up by the *Trent.*

Clipper Chicks

(*Continued from page 31*)

Every Pan American Clipper which now departs from Miami or Brownsville carries a maximum load of 600 chicks, the fluffy little balls of feathered life, 100 to the case, being stored in the rear hold of the cloudland cruiser during transit. The air express rate on New Hampshire Reds (which weight about 2¼ pounds per 100 packed for shipment) is seven cents per chicken from Miami to San Juan, Porto Rico, a 10-hour journey. More than a half-million chicks have traveled to South America by air during the last six months; shipments have been made as far south as Rio de Janiero, 6,000 miles from Miami. A millionaire industry has been built up in record time. Curious to tell, the third and fourth generations of the original parent birds shipped far south are now being delivered by plane as intra-state express in South America. Air delivery has demonstrated its superiority as a common carrier of baby birds in the land of the pampas. Lima for example is being developed as the chicken distribution center of Peru.

END

Guns in the Skies

(*Continued from page* 13)

There the matter of the air cannon, as far as the United States is concerned, seems to rest. Of course, all this is stated with reservations, realizing that there may be a more suitable weapon somewhere in the country, which is being tested in secret.

Today, the regulation American weapons are the Browning MG-40 of .30 caliber and the Browning MG-53, a .50 caliber weapon. The former may be obtained as a fixed, wing or movable gun while the heavier model appears to be only manufactured as a fixed weapon. These guns are made by the Colt's Patent Firearms Company of Hartford, Conn.

The MG-40 has a nominal rate of fire of 1,000 to 1,200 rounds per minute depending on the type of ammunition used. The heavier model turns out between 400 to 650 rounds per minute. Its muzzle velocity is 2,580 feet per second.

Both guns are belt fed, the cartridges being fitted into disintegrator links and may be loaded into required lengths. As fast as the gun fires the expended cartridges and metal links are ejected through a suitable ejection tube and thrown clear of the plane. Unlike most machine guns, they may be fed from either side, the change being effected by the simple-repositioning of some of the component parts, which takes very little time to carry out.

American practice in the matter of fixed guns, incorporates the use of an electrical timing system for synchronization with the prop. The Browning guns, however, may be controlled by the modern Constantinesco (C. C.) oil-hydraulic gear which is still used in most European countries.

For the movable or flexible type of gun, new high-speed mountings have been adopted as improvements over the wartime Scarff ring. The ring has been discarded and a mounting which enables the gunner to store the weapon away out of the slipstream under the fuselage dome when he is not in action. It has a wide angle of fire, is easy to operate in action and appears to be considerably lighter.

The British and French, generally speaking, have remained layal to the Vickers and the Lewis guns, although there is a new tendency in Great Britain to accept the American Browning for several reasons. Experts over there seem to be of the opinoin that the Browning is a better all-around air weapon, and more suitable for mass production in an emergency. Mounting systems are much like those adopted here although the British seem to have found a happier arrangement in positioning their fixed guns so that they are seemingly in a better position for quick and comfortable clearing of stoppages. Wing guns are now general and the French in particular have shown rare ingenuity in designing movable gun turrets and fitting them usefully into the general lines of the aircraft.

The French also, use many Chatterelault guns as wing weapons outside the airscrew disc, and records show that the new Hatchkiss 13.2 gun often replaces the fixed Vickers. Aboard their Loire 46, a single-seater fighter, they have introduced the Swiss 20 mm. Oerlikon in streamlined boxes in the wings. Their Dewoitine D-510 carries the same cannon mounted to fire through the airscrew boss and two machine guns in the wings. The Polish P. Z. L. P-24 carries two 20 mm. cannons and two machine guns.

Italy uses the Breda-Safat guns in most fixed positions as well as a flexible mounting. They come in 7.7 mm. and 12.7 mm. calibers. Their Fiats use the Vickers as a fixed gun and there are a few instances where the Lewis is used as a movable weapon. Japan uses Browning, Vickers and Lewis. Some of their weapons are adaptations of these types in which the barrel casings are changed and different feed systems are incorporated.

To return to the cannon question which is still an important point, we find that European powers seem to have adopted the Oerlikon gun in various mountings. The much-advertised Fokker "Reaper" G-1 fighter has a pair of 23 mm. Madsen cannons fixed to fire through the nose of the nacelle. On paper it appears to be a very impressive air weapon but it is also pertinent that so far no one seems to have adopted the plane for squadron service, at least not at this writing.

Some years ago, the British Blackburn *Perth* anti-submarine flying boat came out equipped with Vickers-Armstrong 37 mm. cannon mounted on a movable turret. It was frankly an experiment, and appears to have gone no further. As far as we can learn, the Dewoitine D-510 is the only military plane actually in production as standard equipment which uses an air cannon.

We have tried to show some of the objections against it. There are two schools of thought both here and abroad involved in the argument concerning the air cannon. One side claims that the air cannon cannot compete with the plane carrying several machine guns while the other side explains that, be that as it may, the destructive power of the air cannon so outweighs the lead-spraying effect of machine guns, that it is ridiculous to speak of the two weapons in the same breath.

As we see the situation, aircraft designers must face the new armament situation and design craft to fit the all-important weapon, a point we might add, that is already being taken up by a group of designers in this country.

END

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Air Mapper

(*Continued from page* 30)

Abrams project. A. Edward Kunzl and a staff of 18 technicians assisted him.

The first "stratoplane" for test purposes has been powered with one Wright 330 h.p. supercharged engine with an adjustable steel propeller, and it is expected that a maximum speed of over 200 m.p.h. will be maintained at a ceiling of approximately 21,000 feet. However, the plane has been designed to operate safely with a supercharged engine of 450 h.p., allowing for greater speeds at higher altitudes. As successive planes of similar design are built, it is planned to use motors of 1,000 h.p. or more to approach the ultimate in high ceilings and speeds. To utilize the advantages of stratospheric flight to the fullest degree, requires a specially designed purpose such as the plane under discussion and one which will adapt itself to new stream conditions.

END

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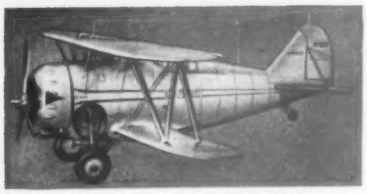

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This Export Business

(*Continued from page 49*)

are placed on wooden platforms together with the plane's fabric-covered sections and the tail cone. The fabric-covered parts are wrapped in aeronautical cloth before being secured to the platforms. The wooden bases have only two sides each built upon them and a wing tip protrudes from one side of each case after the wings are placed into position.

The entire plane now is ready for shipment. The wings and fuselage are hoisted to the deck of a barge by a huge crane. The fuselage is lifted quite easily. The boxes containing the wings are placed into slings before being taken aboard. The crane-barge is then towed to the dock where the hoisting procedure is reversed when the fuselage and wings are placed uon the uppermost deck of a trans-atlantic liner.

When the ocean liner reaches its destination, the wings and fuselage are removed to the nearest airport and the plane is reassembled by either the Fokker Company of Holland (Douglas distributor in Europe) or the Royal Dutch airline, if the plane is intended for them.

The aircraft manufacturer is responsible for the plane until it is safely delivered to the importer, who then takes complete charge of the ship. There are many other types of transport planes exported than those mentioned previously. These commercial craft are much smaller in size, carrying only about three or four persons. These planes are in great demand in Europe and large numbers of them have been shipped abroad. These planes are packed in huge wooden cases after the wings, empennages and—in a few cases—the landing gear have been removed. As almost all the small transport types are fabric covered, it is not necessary to spray these ships with a rust preventive. Frequently planes are exported without having been boxed in order to keep costs low. This method may seem to be quite risky but is claimed to be a more efficient arrangement. The wings, tail surfaces and landing gear are packed in a box separate from that of the fuselage. These crates are usually taken to the waterfront on large trucks. The boxes are clearly marked with the length, height, weight and destination of the shipment. The planes are reassambled abroad under the supervision of a representative of the manufacturer.

Truly, the exporting of aircraft is one of the boomingest phases of the American aviation industry today. Commercial exports are impressive; military exports would be even more than they are at present, were it not for the strict neutrality policy adopted by the United States.

Almost without exception, every country in the world has imported or secured American-manufactured aeronautical equipment. The exporting of airplanes and other aviation equipment has reached a new zenith in the United States of late and will probably rise to even greater heights in years to come.

END

Letters! Letters!

(*Continued from page 28*)

pensating for my weakness has entirely made up for any abnormal vision. My instructor said I not only was capable of flying, but was a born flyer. I *know* I can handle a ship, my instructor knew it, and since then I have been checked out on over a dozen ships by various pilots and they all seemed to think I was capable.

I don't ask you to condone what I've done. I have no ambition to be an airline pilot nor do I intend to follow it as a profession. A private license is all I will ever ask. I had to learn to fly so I did. I made my dream come true, at least in part, and all I want now is to fly for pleasure. Would the Bureau of Air Commerce have allowed me to do that? No, because a man sitting in Washington says I would be a menace to the airways. . . .

R. W. G.
Chicago, Ill.

* * *

Sugar Trouble . . .

Sirs:

Some time ago my brother owned a Curtiss *Junior*. The 45 h.p. Szekely engine was replaced with a Velie 65 h.p. motor. The ship was not licensed due to the increased weight and it was a tricky job to fly. My brother gave me time in it and, after some eight hours, I soloed. Then I built up 23 hours of solo time. Later my brother bought a new Taylor *Cub*. As it was a licensed airplane, I could not fly it without a student's permit, so I applied and went through the examination. I passed with a transport rating until it came to the urine test. This was found to have a trace of sugar in it.

The doctor would not issue me the permit until he heard from the Department of Commerce. The answer came, and went something like this: as I had never held a license before, it would be impossible to issue me a permit.

I went to a laboratory and had another test made. It showed no trace of sugar. When I showed the report to the (Bureau of Air Commerce) doctor, he would not take it but made another himself. His test then showed no trace of sugar. He wrote the Department of Commerce and sent in his second report. All of this happened some four months ago. To date I have not heard anything from either the doctor or the Department of Commerce.

ALLEN L. SIMS, JR.
Port Aransas, Texas

THESE are a very small part of the mail we have received. Further excerpts like these will appear in the March issue of POPULAR AVIATION. *Meanwhile, if you have not already written us of your case, and you have had an experience that parallels those described here, by all means write in. If you wish, your name will be held confidential.*—THE EDITORS.

(*Continued on page 89*)

The Birdmen's Perch

Don't ask us why, but it seems that a lot of people are just as big pushovers as we are when it comes to solving puzzles and brain-teasers. We've published a few in past issues, and would like to try a few more in the future. If you have any hot ones scribble them down for us and shoot them in pronto to:

MAJOR AL WILLIAMS, alias "Tattered Wing-Tips," Mgr., Gulf Aviation Dept., Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.

HIGH SPOTS OF RESEARCH

"*Dear Al:* I accept the explanation of Mosley Hussey, Jr. as to 'How Flies Land.' His laboratory has got something there, I think.

"Still, I can't understand how fly specks, (diagram of same will be found at the extreme end of this paragraph), get on the ceiling. If Mosely can figure this out he deserves at least the Collier Trophy."—**Bill Young**

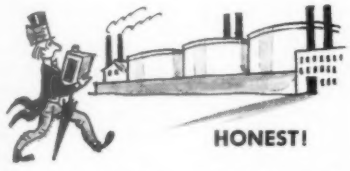
"P.S. I *never* use Gulf Aviation Gas, on account I have no airplane. Good Gulf, however, makes my new Olds do *everything* the salesman said it would, and believe you me that's no applesauce."

NEATEST-FEAT-OF-WEEK DEPT.

"*Dear Butch:* Early last summer, hopping sight-seers from the Trinidad Airport, I took a couple of young farmers for their first hop. At an altitude of about 1500 feet one of them leaned forward and yelled 'We don't seem to be moving at all.' I yelled back 'You guys quit dragging your feet,' and forgot about them.

"Some ten minutes later, before cutting the stick to land, I happened to look back and lo and behold the two gentlemen were still holding their feet straight out and about a foot off the floor.

"Says I, 'Okay boys, put 'em down now, we're going to land.' Down came the feet, and we dropped into an easy glide."—**W. R. Sutherland**



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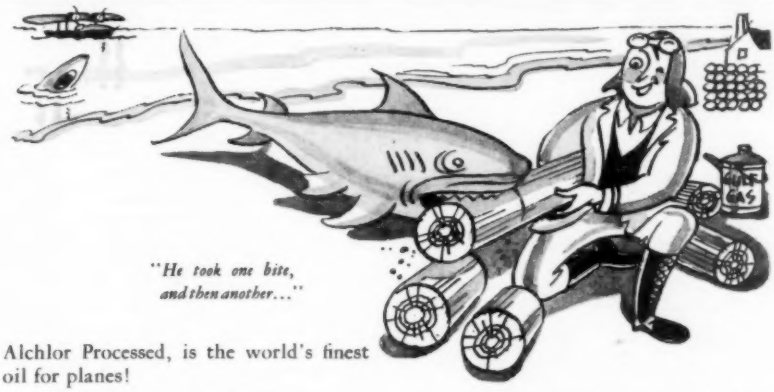

"He took one bite, and then another..."

BUG-HOUSE CORNER

Speaking of puzzles, Tattered Wing-Tips is still having a knock-down fight with some pals of ours over this one:

We told them to take two cups full of gasoline, one pink and one white. We

told them to take a teaspoonful of the pink gas and stir it in with the white gas, and then put a teaspoonful of the mixture back in with the pink gas. We said that they would then have just as much pink gas in with the white as there was white in with the pink. Are we a liar? (*When you write for correct solution, please give permission to quote your letter*).

THIS MONTH'S WHOPPER

"*Dear Major Williams:* Well sir, I lived on a beach and owned a small flying boat. Of course I used Gulf Aviation Gas as this was the only gas I could use that would make the darn thing fly.

"Anyway, one day I happened to spill some of it into the water, and a shark playing around the ship got a mouthful of the gas, and Zzip! away he swam. Only he forgot which way land was, and was several yards upon shore before he stopped.

"I didn't want him to die out of water, so I went ashore and took a fair-sized pole and poked him in the head with it. "He took one bite of that log, and then another and another, and pretty soon I had enough wood sawed up to last me all winter. Now would you believe it, he comes back every fall and wants some of that Gulf Aviation Gas, then he saws wood to last another winter!"—**Harry Cramer**

Dear Mr. Cramer: We believe it! We even had an experience quite similar. Only our fish was a saw-fish instead of a shark.

When he tasted that wonderful Gulf Aviation Gasoline he hopped clear out of the water, fanned his fins just like a humming-bird, and went darting here and there trying to coax another drink.

Of course he didn't do any heavy wood-cutting like your shark, but we could hold up a picture pasted on a board, and he would get all poised and dart back and forth and cut out the dandiest jig-saw puzzles you ever did see.

We haven't seen him since he got married and gave up drinking. But we hear that he's raising one of the slickest little families of flying fishes in the whole Atlantic Ocean—Editor.

Gulf Oil Corporation and Gulf Refining Company . . . makers of

GULF **GULF AVIATION PRODUCTS**

Old Jenny and Her Habits

(*Continued from page 36*)

and air circuses to airmail routes. And to start the ball rolling with a modest purse, they took many of the old Jennies off the market.

It was during this era that our country saw more flying and more different kinds of flying than before or after the Big Disturbance. And it is, therefore, perfectly natural that after discovering poor old Jenny's limitations, in the various lines of aeronautic endeavor, the pilots began re-inventing and re-constructing Jenny's architectural features. Within one short year, there were more accessories and special equipment marketed for Jennies than for Model "T" Fords and that is saying a lot. As a matter of fact, replacements for JN4-D's and OX-5's were the mainstay of the few small firms remaining in business.

First of all, during the reconstruction era, came the so-called "high-lift" monoplane wings with which the Jennies were frequently equipped for flying express, passengers and mail. These were deep section monoplane wings that replaced the former biplane wings and which added considerably to the performance of the old ship. There were Sikorsky wings, Martin wings, and so forth, almost without end. And the funny part of this monoplane wing activity was the fact that the added cost of a new wing brought the total cost of the rebuilt ship to the price of a brand new plane.

This type of wing was made necessary in the many cases where the plane was converted into a three-seater for carrying two pay passengers, or where it was used for carrying airmail or equipped with pontoons for overwater flying. Again, the reduction of parasitic resistance by the removal of the maze of interplane stay-wires and struts improved the former speed range of 43 to 75 m.p.h. to as high as 105 m.p.h. when corresponding alterations were made in the propeller and power plant. The old original two-bay biplane structure consumed a lot of power that was made available reserve power by the monoplane wings.

Improvement in performance, at least in horizontal speed, was often accomplished by clipping Jenny's wings, even up to the point where the original two-bay structure was cut down to a single-bay span with a corresponding reduction in bracing and parasitic resistance. It was at this point that many owners got themselves in serious difficulty and crashes with clipped wing Jennies were numerous. In most cases, the aileron areas were not readjusted to the demands of shorter wings so that such ships frequently went out of control, again giving Jenny an undeserved bad name.

Increased live-loads in the way of additional passengers, heavy express loads, etc., soon revealed the limitations of the powerplant and attention of the Jenny experts was quickly called to the fact that she was being used as a transport ship without a compensating increase in power or power transmission.

For a short time, the structural changes were slighted in a vigorous attempt to gain greater h.p. Very revolutionary alterations were made in the OX-5 engine and, in many cases, the OX-5 was thrown out and complete new installations were made with the higher powered Hissos, Hall-Scotts and Dusenbergs. There was no doubt but what the performance was very limited with the standard 90 h.p. OX-5, regardless of the improvements made in the plane itself.

They were then treated to a rapid development in improved valve-actions, new and more efficient OX-5 carbureters, improvements in both magneto and battery ignition systems, improved radiators, water circulators and all of the rest of the improvements that were as numerous as the accessories for a Model "T" Ford.

Probably one of the most effective of the powerplant improvements were the improvements in propellers that allowed the engine to rev up faster and at the same time introduced a higher propeller efficiency. There was a deluge of revamped JN4 propellers, including the historic "tooth-pick" propellers, created by shaving down the old JN4 propellers to a tapering thin point at the tips. There was good money in shaving down the props and there were, therefore, many wood-working shops devoted exclusively to this job.

Added to the reconstructed JN4 propellers were the Canuck propellers imported from Canada and gave far better results in flight than the standard props provided in this country. Either a toothpick or Canuck propeller placed on the shaft of the OX-5 gave increased flight speed and climb, even with the heavier loadings imposed by the three-seaters.

It was found possible to convert Jenny into a three-seater by widening the fuselage between the original two cockpits and installing a side-by-side seating arrangement for two passengers, the pilot's cockpit remaining close to its original position. Scores of blueprints were published for instruction in making this alteration, together with instructions for reinforcing the weak forward fuselage section. This fuselage enlargement was a necessity for mailplanes or express service.

The cost of making a three-seat conversion was quickly paid off at the cow-pasture airports where passengers were carried for sums ranging from $10 to $5 per ten minute hop! Yes, there was gold in passenger hops 25 years ago and the Jennies made it possible to maintain an economical schedule.

One of the Gates Circus pilots, operating a passenger carrying service after the show was over, carried $900 worth of passengers before darkness called a halt on his activities.

Many of the accidents attributed to Jennies can be charged up to the fact that the majority of these ships were staked out in the open, winter and summer, without the protection of a hangar. Continued exposure to rain and snow loosened up the glue joints and rusted the stay wires to the point where a stripped wing or a dislocated tail group were not unusual. Pilots were naturally unwilling to build a $1,000 hangar for a ship that cost them about $50 in the raw and crashes with these weather-beaten planes occurred with startling frequency.

END

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P. A. FEB. 1938

Those Leaping Russians

(*Continued from page 56*)

which I saw under Kiev I regard as a fact which has no comparison in the world. The descent of the large army subdivision was no mere mass review. The parachutists were competent, well organized fighters, who engaged in combat only a few minutes after reaching the ground."

General Monti, chief of the Italian military mission, declared: "I am absolutely rapturous over the application of the aerial expeditionary force, which under conditions of great distances permits the transfer of military operations into the deep rear of the enemy. I was tremen-impressed by the agility and skill with which the parachutists had fulfilled so responsibile and difficult an operation."

In an equally unqualified tribute, Division General Luzha of the Chechoslovakian Army asserted that at the present time only the Red Army is in a position to accomplish such operations on a big scale.

During recent maneuvers in Minsk a simultaneous leap had been made by 1,200 armed soldiers, the entire force landing from heavy transport planes in less than eight minutes. The troops were accompanied by parachuting machine-guns, 150 of them, and 18 pieces of light field artillery which was booming a few minutes after landing.

Incidentally, during the above-mentioned Kiev maneuvers, the parachuting troops demonstrated how useful such tactics may be in checking an advancing enemy army. They landed between the main body of the enemy and the latter's approaching reinforcements, disorganizing the communications between the two, and 'saving' the capital of Ukraine.

An impressive simultaneous leap was witnessed last season under Moscow when more than 2,200 soldiers with full paraphernalia negotiated as many landings in the "enemy" rear, to be joined by 3,000 more troops landed regularly by giant transport planes.

The attitude of a Soviet parachuting fan is well expressed by V. Dzenoff who has about 50 jumps to his credit:

"Truth to tell, it is not so much the number as the technique of jumps that interests me."

This sportsman does not jump for jump's sake, but to enrich his experience. Consequently, he endeavors to vary the nature of his leaps. In addition to droppin, from normally flying planes, he also seeks those in stunting positions, including craft in most breath-taking situations. Dzenoff has jumped in the daytime and at night, in winter and in summer, in rain and in sunshine; he jumped with cosiderable delays in pulling the cord.

One time he dropped with high wind blowing. This carried him for about two kilometers from his intended destination. The first time he jumped at night, near the Tushino Airport, he had nearly met with a serious accident; immediately after separating from the plane, his eyes were caught by the sight of Moscow sparkling underneath with its millions of lights. "A sight from the fairyland! Here I had to figure out and manipulate for a landing, and instead I lost myself in admiring the city. However, I pulled out of that safely."

In a recent issue of the *Pravda*, Captain B. Ageev paid homage to the work of such world-famous Soviet parachutists as Evdokimoff, Evseev, Zabelin, Kaytanoff, Amintaev and others and admitted the undisputed supremacy of the U.S.S.R. in this exhilerating sport, but stressed the need of extending the already imposing facilities for training tens of thousands more, and of further perfecting the research into the theory of the jump, psycho-physiological fitness of would-be parachutists, and related questions.

END

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A. Warnaar, Voorburg, Holland.

Depression Ends at Cubville

(*Continued from page 34*)

Commerce regulations. That's why we have never had an accident."

"Not a single one?"

"Not one. However, Johnny bought a sport biplane one Saturday, rented it to a couple of fellows—pilots—on Sunday, and they took it out and stunted the wings off. Killed all three of 'em, too. He didn't have insurance, either. Excuse me."

"That guy Bates must be a cold-blooded individual," I said to Johnny later. "He talks about killing people like I'd talk of a Sunday school picnic."

"That's the kind of a guy he is," Johnny said. "He isn't as tough as he pretends to be about such things, though. He just takes things matter-of-factly. He doesn't know what nerves are. Did he tell you that he got his start as a pilot by doing wing-walking stunts at county fairs? A fellow who has done that, especially when he was just a kid, doesn't fear or think much about violent death."

"What about you?" I asked. I had been watching him do everything to the Travelaire but land it upside down. "Have you ever had any close squeaks?"

"Plenty," he grinned. "Not long ago I had to knock a guy out to keep him from killing both of us."

"How come?"

"Well, this fellow was drunk—but he didn't show it. He came in and asked to be taken up in a *Cub*. I took him out. When we were up about 3,000 he started yelling that he wanted to walk a wing. And he started to do it, too. Well, there was only one thing I know to do. I went into a power dive, knowing that the centrifugal force would hold him in his seat. But I couldn't dive all night, and when I started to climb for altitude he dropped the door, and holding on to the stick with one hand, started out on the wing. Just before we went into a spin I turned loose the stick, squirmed around in the seat and socked him on the jaw. He went out like a candle. Believe me, I didn't lose any time landing. It developed later that the kid had accidentally shot and killed his brother a short time before, and it was preying on his mind so that when he got a little tight he decided to jump out of a ship and commit suicide. I could tell you things like that all day, but I don't have time. Come on, I'll take you fellows up for a spin."

So we went up. The first time, we both went up in the Travelaire. Frankly it scared the pants off me when Johnny pulled the ship up in a stall and then nosed over for a drop of about 500 feet. And I was none too brave when he did tricks with the lightplane a little later to show me how safe it was. I'll admit that a remark Kenny made while Charlie was aloft made me glad to be on terra firma. "That guy is a daredevil," he said, as he watched Johnny doing things with the *Cub* that was enough to make Charlie's hair stand on end (it isn't slicked down good yet), "but he's a swell pilot."

As a matter of fact my pictures of the antics of the trick horse manned by two kids who are acting as grease monkeys for their tuition were kind of blurred. Of course I wasn't nervous, but, the light was bad or something.

Anyway, we're both thinking of taking a course at Cubville.

END

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6"	5c	15c
7"	6c	20c
8"	7c	25c
9"	8c	30c
10"	8c	35c
12"	10c	45c
14"	14c	55c
15"	15c	60c

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1/16 sq., 15 ft. 5c
1/8 flat....15 ft. 5c
Skein 50c

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5/8x1 x 8 3—5c
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LUSCOMBE SCHOOL of AERONAUTICS
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An Airy Chat With the Editor

(Continued from page 9)

has a profound respect for the skill of the average American amateur.

He has seen young fellows successfully build complete full size automobiles from kits in barns, sheds and even basements. He has had the very great pleasure of seeing successful lightplanes built from his kits and drawing and, at a still later date, radios and television equipment of a very complex nature. Therefore, he is a thorough believer in the American amateur and American kit-set construction. Surprising indeed are the excellent planes and gliders turned out by mere beginners with little equipment with which to work.

* * *

WE have an excellent article this month describing the construction of an airplane direction-finder that should appeal to mechanically inclined private pilots and home-builders. This bit of equipment, while supremely useful as an aid to flight, is really very simple and easy to build, using standard parts easily obtained from radio appliance dealers. This is the first time, we believe, that the construction of such apparatus has been described in the aviation press.

* * *

THOSE of our readers who have followed the Chinese-Japanese conflict during the past few months, must admit that the Chinese can really fly and do things with their planes that cause the Japanese a whole lot of annoyance. Time was, when a poor pilot was called a "Chinese Ace", but that nickname has long ago been rubbed out by the illustrious Asiatic pilots in actual flying service.

* * *

WE note with interest, taking our dope from the daily papers, that both the Japanese and Chinese airforces are credited with the long heralded "dive of death" first devised (but not carried out) by 125 of Italy's aces.

While we can believe this act of suicide would be in keeping with Japanese traditions and temperament, being akin to the famous hari-kari gesture of death, yet it is hard for use to reconcile this performance with the philosophy of the Chinese people. As a matter of fact, we doubt whether this bomb-riding performance was actually pulled off by either of the contestants, it being far more probable that the whole affair originated in the mind of some over-heated war correspondent.

* * *

SOME months ago, our military expert T-2003 demonstrated, by word and diagram, that the "dive of death" was a futile mission if the enemy were at all on the alert. He showed that the dive, necessarily being in a straight vertical line, could be very easily broken up by rapid fire naval guns before the diving plane could approach within 2,000 to 3,000 feet of the target. It is comparatively a much simpler matter to hit a diving plane travelling along a straight vertical line than to make a direct hit on a plane in wavering deviating horizontal flight at an undetermined altitude.

* * *

WELL, well, we see that one of our senators is about to take up the cudgel and will proceed to teach the Bureau of Air Commerce what it is all about. He claims that the B. A. C. is the cause of airline accidents rather than the prevention thereof and that he intends to pull off one of those famous Washington investigations. So many forces are now bombarding the poor old Bureau that it is actually awakening our sympathy.

If the truth be known, it is being made the tool of various political activities and is therefore more sinned against than sinning. It has been a delightful plaything for the meddlesome fingers of the politicians who have been able, through the basic unconstitutional organization of the Bureau, to play at being Hitlers, Stalins and Mussolinis.

* * *

LOUD voices from Washington proclaim that the Bureau is to be adjusted to the principles of, or made a part of, the notorious Interstate Commission, and points out the fine achievements of the latter institution with great pride. If you think, at any time, that the Interstate Commission has been an unmixed blessing, then ask any railroad or interstate bus official for his opinion. We think that an alliance with the Interstate Commission is simply jumping from the frying-pan into the fire.

* * *

IT is regrettable that the forces which have harassed the railroads for so many years are to be turned loose upon the airlines, particularly when the latter are so young and weak that they are practically defenseless. When they hopped on the railroads, the roads were strong enough to fight back some of the oppressive measures aimed at them, but knowing airline organizations quite well, I am assured that they have not the organization to combat political meddling and interference.

One of the features of regulation, that really assisted the railroads but which will act adversely on airline operation, is the standardization of railroad equipment. The railroads, at this time were in operation long enough to make standardization highly desirable but this is not the case with the airlines who have not yet developed to the point where standardization is necessary or even advisable. To attempt standardization at this time will stifle progress and curtail invention, just as standardization always does in all industries when started promiscuously.

* * *

AND, just before we hit the bottom of the column with a loud resounding smack, we'll just remind you that the next issue will be the outstanding issue of old P. A. yet produced.—J. B. R.

HOME OF THE DAWN PATROL

The days that are quickly slipping by while you procrastinate your future, will soon be months that could have been put to valuable use in acquiring the experience that YOU must have to fill the important places Aviation has waiting for trained men. Even if you do not contemplate a flying career, SPARTAN Training will give YOU the experience so essential in Aviation and allied industries. To wait, is to gamble with YOUR future—tomorrow's opportunities will be for those who ACT TODAY!

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SPARTAN COURSES OFFER — *The Fastest and Most Economical Method of Entering the Industry.*

Ballooning

(Continued from page 62)

when it comes in contact with the air, and a spark at the right place would set fire to the outfit. This thought was not at all comforting, and I threw out the remaining ballast in an effort to get above the storm. Every part of the balloon and rigging was charged with electricity, and every time there would be a flash of lightning the rigging would snap tiny sparks, and my hair was also charged.

Then, suddenly, we became drenched, and just as suddenly we burst out into brilliant sunshine. We had reached the top of the storm and before the balloon stopped the rapid ascent we were over eight thousand feet high. And there we hung, listening to the infernal racket of the storm beneath as it ripped along over the ground.

After some time the storm cleared away and it was a very simple matter to make a safe landing on the outskirts of a village, as there was no wind.

END

Medal of Honor

(Continued from page 24)

On Aug. 8, 1918, he engaged five enemy scout planes over Licourt, France; singling out one and diving on it, he opened fire at close range, causing it to crash to the ground.

On Aug. 9, 1918, over Licourt, France, observing a British plane being attacked by three enemy scout planes, he immediately engaged one of the enemy, firing a long burst at very close range; the enemy plane bursting into flames and crashing to the ground.

On Aug. 25, 1918, over Hancourt, France, he attacked four Fokker enemy planes, diving into their midst and firing a short burst at one of them from a short range, destroying the plane, the pilot of which descended to safety in a parachute.

On July 25, 1918, over Fismes, France, he drove down out of control an enemy Fokker plane; on Aug. 10, over Perrone, France, one Fokker biplane, and on Aug. 29, over Cambria, France, one Fokker biplane. In all these engagements he displayed the greatest devotion to duty and gallantry in the face of the enemy.

* * *

CLINTON JONES

R—San Diego, Calif. B.—Ross Valley, Calif. G. O. No. 66, W. D., 1919. Near Landres-et-St. George, France, Oct. 30, 1918.

Second lieutenant, pilot, 2nd Aero Squadron, Air Service.

Lieutenant Jones, while attacking four enemy planes (Fokker type), was in turn attacked from above and obliged to dive through a formation of 15 planes (Fokker type). His plane was riddled with bullets, but he managed to destroy one of the enemy machines.

Oak-leaf cluster. For the following act of extraordinary heroism in action near St. Mihiel, France, Oct. 18, 1918, Lieutenant Jones is awarded an oak-leaf cluster to be worn with the distinguished service cross: He was a member of a patrol which succeeded in hedging in a fast enemy biplane.

Approaching the enemy plane, Lieutenant Jones signaled the enemy to give up and land. The reply was a burst of machine-gun fire, which cut his windshield and set fire to his plane. He then closed in and shot the German pilot and sent the plane crashing to the ground. He landed in his own plane and extinguished the flames

* * *

JAMES A. MEISSNER

R—Brooklyn, N. Y. B.—Canada. G. O. No. 121, W. D., 1918. In the Toul sector, France, May 2, 1918.

First lieutenant, 94th Aero Squadron, Air Service.

He attacked three enemy planes at an altitude of 4,800 meters over the Foret de la Rappe, France. After a short fight he brought down 1 of the machines in flames. During the combat the entering wedge and the covering of the upper wings of his plane were torn away, and after the battle he was subjected to heavy fire from anti-aircraft batteries, but by skillful operation and cool judgment he succeeded in making a landing within the American line.

Oak-leaf cluster. A bronze oak leaf is awarded Lieutenant Meissner for the following act of extraordinary heroism in action:

On May 30, 1918, he attacked 2 enemy planes at an altitude of 4,500 meters above Jaulny, France, and after a sharp engagement shot one down in flames and forced the other back into its own territory.

* * *

HOWARD BURDICK

R—Brooklyn, N. Y. B.—New York. G. O. No. 38, W. D., 1921. Northwest of Cambrai, France. Sept. 28, 1918.

Second Lieutenant, 17th Aero Squadron, Air Service.

Attacked by two Fokker biplanes, he outmaneuvered both machines, shot one

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into flames and routed the other one. Later, seeing three Fokkers attacking an American aviator, he at once dove into the combat to his assistance, shooting down one and driving off the other two. His quick and unhesitating attack, single-handed, on the three Fokkers saved the life of his fellow pilot.

* * *

REED M. CHAMBERS

R—Memphis, Tenn. B.—Onaga, Kans. G. O. No. 14, W. D., 1920. Over the region of Epinonville, France, Sept. 29, 1918.

First Lieutenant, 94th Aero Squadron, Air Service.

While on a mission, Lieutenant Chambers, accompanied by another machine piloted by First Lieut. Samuel Kaye, Jr., encountered a formation of six enemy machines (Fokker type) at an altitude of 3,000 feet. Despite numerical superiority of the enemy, Lieutenant Chambers and Lieutenant Kaye immediately attacked and succeeded in destroying one and forced the remaining five to retreat into their own lines.

Oak-leaf clusters (3). A bronze oak-leaf cluster was awarded to Lieutenant Chambers for each of the following acts of extraordinary heroism in action:

First oak-leaf cluster: Near Montfaucon and Vilosnes-sur-Meuse, France, Oct. 2, 1918, Lieutenant Chambers, while on a mission, at an altitude of 2,000 feet, encountered an enemy two-seater (Halberstadt type). He immediately attacked and, after a brief combat, succeeded in shooting it down. This was one of the most remarkable of his adventures and worthy of citation.

Second oak-leaf cluster: Near Montfaucon and Vilosnes-sur-Meuse, France, Oct. 2, 1918, at 7:40 o'clock, Lieutenant Chambers saw four enemy machines (Fokker type) attacking another American machine (Spad type). He immediately went to its rescue, and, after a few minutes of fierce combat, he succeeded in shooting down one.

Jap Planes

(*Continued from page 34*)

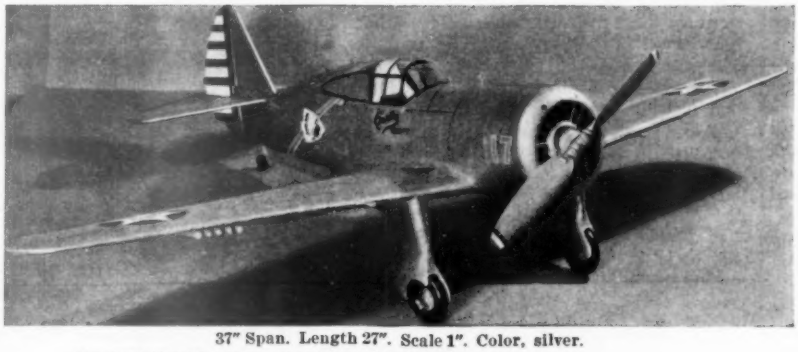
Landing-gear and tail wheel are retractable. The streamlined fuselage is of monocoque construction skinned with Alclad sheets. The main wings single spar of steel.

The power plant is special made Kawasaki 800 h.p. engine, equipped Prestone Cooler and variable pitch metal propeller. We wish success to this new super plane, and that it will establish new brilliant world's aviation records in the very near future.

Present regular airliners in Nippon are largely of foreign design and produced with home materials. The types are: Fokker Universal (Nakajima), Airspeed Envoy (Mitsubishi) and Beechcraft (Tokyo Hikoki, sister company of Japan Air Transport Co., Ltd.)

END

THE WORLD'S FINEST MODEL AIRCRAFT



37" Span. Length 27". Scale 1". Color, silver.

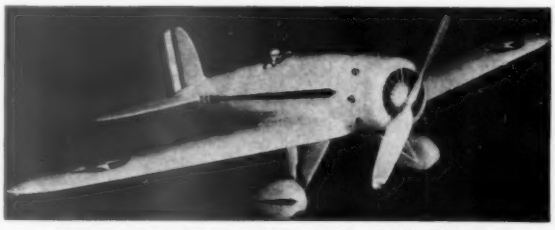
LOCKHEED P23A NAVY FIGHTER

CURTISS HAWK
"75" or P36A
New U. S. Army Fighter
37" Span. 1" Scale

Set has all parts printed on balsa, turned 4" balsa motor-front, 10" carved prop. shown, silver dope, glue and all parts to build. Set Postpaid—$3.25.

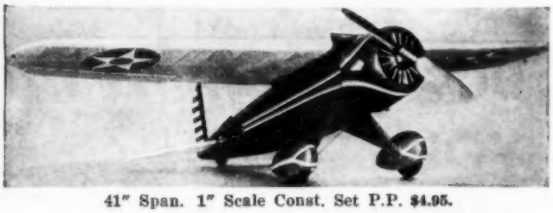
DeLuxe Set same as above except it has 4" cellulojd motor and 4" aluminum cowl. Set—$4.00.

The U. S. Army has ordered 220 of this new type plane.



COMBINATION LAND AND SEA PLANE
32" Span. Length 20½".

LOCKHEED ARMY SPEED VEGA 41"



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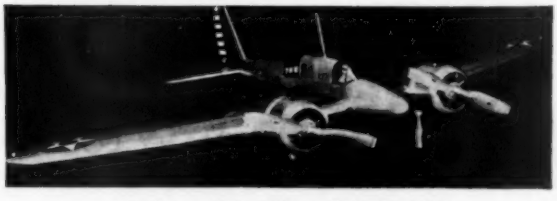

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Send 10c coin for 16-page catalog beautifully illustrated with large 6" photos of latest type planes.

MINIATURE AIRCRAFT CORP., 83 Low Terrace, New Brighton, N. Y.

The Man Under the Hood

(*Continued from page 30*)

we're charitable today so won't mention his name—talked a lot but finally admitted he was sore only because he now has to give students eight hours of dual before kissing them off on their solo attempts.... I'll merely remind my irate friend that the Army Air Corps demands 10 hours of dual of all pilots sent to Randolph Field—whether they've had experience or not—before they are allowed to take one of Uncle Sam's PTs off alone.

* * *

The Continental A-40 engine—yes, you all know that one, the little four-cylinder opposed air-cooled job that perks along in so many *Cubs*, Taylorcraft and even a few new Aeroncas—is a pretty fair engine.... But the Continental engine company is continually in a battle with its customers. ... At the moment they are having verbal fights with the new Piper Aviation corp. (manufacturers of the Taylor *Cub*); the Taylor-Young Airplane company; and the Aeronautical Corporation of American (Aeronca).

C. G. Taylor, designer of the Cub and the Taylorcraft, has sworn a great oath never to buy another Continental if he can find a substitute motor.... He's also refused repeatedly to even try out the new Continental 50 h.p. engine.... Taylor says the new engine would ruin his swell little ship and everybody who has seen or heard the engine run says it's rough and very much in the experimental stage.... There's a great opening on the small plane market for a reasonably priced motor of about 50 h.p. now.

* * *

George Palmer Putnam—Mr. Amelia Earhart—never overlooks a chance to make a dime.... You may have seen his latest cashing in on a swell gal and a good pilot.... It's his book, "Last Flight-Amelia Earhart."... Her notes and messages sent back from each stage of her world flight until the one she missed.... At that it's an interesting collection.... You might like it.... You may also recognize therein some pages in which Mr. Putnam takes it upon himself to answer some of the whispers that went around about his life with his wife.

* * *

International situation note: American newspapermen who in the past have been allowed to visit the Navy aircraft carriers and report sights they saw have been denied permission recently to attend winter maneuvers on the Pacific.... The Navy department says that no civilians are being allowed to see any Navy secrets because of the current involved international war developments.

* * *

Here's another: Every German Lufthansa ship (that's the German state-subsidized airline) that flies out of German territory these days carried a co-pilot who is an officer in the German Air Force.... The idea is that by putting the younger air corps officers with the old airline pilots they pick up experience in weather, in airway aids and in the geography of countries they may well attack from the air in the near future.... In other words, the air force officers learn the lay of British isles, the territory around London, Paris, etc. ... What they are doing is well known, and the British, French, etc., can do nothing about it.

* * *

And next month, right in this same space will be some more military comments providing we are not already at war.

DO YOU KNOW NAVY COLORS?

POPULAR AVIATION NAVY COLORING CHART

If you think an American naval airplane is painted up the way it is just for the color effect, well, you haven't been paying close attention to POPULAR AVIATION. The fact that there is method (it's quite ingenious, too) to those Naval paint jobs gave us a bang-up full color feature. It appeared in the February, 1937, issue and we've now been forced to order reprints for sale. Every color and marking is graphically charted. For a reprint, send 25c in cash to

POPULAR AVIATION 608 S. Dearborn St., Chicago, Ill.

Mrs. Martin

(*Continued from page 16*)

plane. Martin touched the horse with his whip, and presently as Bill galloped down the hill, the plane gained enough momentum to leave the ground. Martin managed to keep it in the air for several hundred feet before landing it safely.

Then it was Mrs. Martin's turn to go up. "I kept it at about 50 feet in the air and traveled about 75 rods in it," she said. "I wore a big picture hat with flowers and a veil tied over it." They estimated that the plane weighed about 175 pounds exclusive of its pilot.

Since it was a snowy winter, they then decided to replace the rather fragile wheels, two in back and one in front, with runners. Other touches to stabilize the craft were also put in place. Finally it seemed so safe that they even decided to let their six-year-old daughter, Blanche, now a respected matron and mother of several children in Waynesburg, Ohio, fly the craft.

Blanche was probably the first child in the world to ever take an airship aloft alone.

"Of course we tied the two levers so that she couldn't fuss with them," explained this amazing mother. "She flew for almost 300 feet in it before coming down safely."

Naturally the fame of the strange "contraption" on the Martin farm spread widely. Sightseers came from miles around and sometimes the couple took the plane aloft as many as 50 times a day with old Bill as "tower" at first, and then as the days of the horseless carriage came, Martin purchased one to do the towing instead of the faithful horse.

In 1909 an invitation came from the old Morris park racetrack officials in New York for the Martins to bring their plane up for a series of exhibition flights.

Nothing daunted, the two left their quiet farm and headed eastward. Presently they were thrilling as many as 50,000 spectators a day with their daring flights around the famous old track.

The demonstrations came to grief, however, when the plane collided with a fence at the end of the track one day, and the Martins regretfully picked up the pieces and sent it on home in boxes.

Again, nothing daunted, Martin started to build a new plane.

While Congressman John McSweeny of Ohio arranged to have the first one sent on to the Smithsonian Institute, the inventor worked on a new heavier-than-air machine which was to have an engine in it.

He wrote to Lieutenant E. P Lahm, of the U. S. Army, then in Europe, a noted balloonist of that era, asking him to find some engines of the type he wanted, and to ship them to him. Lahm obeyed. The old engines now reposing in the Martin loft were the result.

It would seem highly desirable to collect data and material on this early plane for exhibition in a national museum—if only to prove the existence of a heavier-than-air machine earlier than that of the Wrights'. END

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Waterproofed. Taped and sewed together. Sewed-in ear puffs. Built for real wear and tear. Can't be beat at... **98c**

FACE MASK
Covers entire face and chin. Removable mouth piece. Specially constructed nose piece permits free breathing. Strongly constructed and expertly tailored. Just the thing for flying, ice-boating, skiing, skating and all other winter sports. First time at this amazingly low price.... **$1.98**

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☐ Enclosed find $1.00 deposit. Balance C.O.D. plus slight postal charge.

Name .....Street Number .....

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(Be sure to print clearly)

Clear and Unlimited

(*Continued from page 52*)

of a dream. The weight of the pontoons give her a nice "bite" on the air (you know immediately that you've got a handful of aircraft), nor is there any pendulum effect from this extra weight hanging down below. Probably the most surprising part of all is that she is definitely faster than her landlubber sisters. Each time they raced a landship against the little seaplane she trimmed the pants off them—and I don't mean wheel-pants.

This craft seems destined for wide popularity in large communities where water commuting is possible. In Chicago and Detroit, for instance, where the summer population is scattered along the lake fronts. Also, in Long Island Sound region, where getting to and from the Big Burg is one of hot weather's more arduous hardships. The *Cub*-on-floats is easy to buy, cheap to operate and a real joy to fly, just three more factors to insure its success.

It is old stuff now, the Cub Distributors Meeting, held at the factory early last November. But it will bear repetition to say that this meeting was the first time that an airplane sales campaign was carefully planned in co-operation with the men who actually get out and sell the product. Mr. Wm. T. Piper, head of the bustling company, was a lavish, thoughtful host, and the principal theme of the session was the inclination to give the distributors and their dealers the best break possible.

Mr. Piper plans to build and sell 4,000 *Cubs* in 1938, quite a sizable hunk to bite off in anybody's language. But if two-fisted planning and selling mean anything, they will more than likely go over the top. Oh, of course there are some who hoot at the idea of getting rid of that many airplanes for money. But then, most of these scoffers are of that breed of man who can't see beyond the limits of his own back fence, and therefore don't know anything about the American public's burning will-to-fly. Personally, I have a hunch—based on lots of travel and careful observation—that Mr. Piper and his gallant associates, are about to lead aviation into its rightful heritage; that devoutly sought con-

". . . There goes Oswald showing off again with those blind landings!"

summation whereby Mr. Joe Everyman can start flying.

Lotta Scud . . .

Wonder why the Bureau of Air Commerce doesn't stagger the Itinerant Fliers' weather reports, or, at least, why the several D or C stations on 236 kcyls, don't broadcast weather on exact schedule. As it is, they are overlapping horribly—Chicago, Newark, Pittsburgh, Cleveland, etc., etc.—so that a citizen in trouble gets nothing. . . Speaking of the B.A.C., a happy note is discovered in the job Leonard Jurden is doing in the Eastern District. He's fair as a die and keeping the boys on their toes. Which is okay . . . Echoes of the opening guns against the Imperial-Pan-American ocean gobble have already drifted back from Washington. One thing has been revealed, namely, where some of the stockholders hoped-for-profits went. To buy up all the copies of the Portuguese *Official Gazette*, which carried a copy of Pan-Am's monopoly with that government. Keep Americans out of the air—over Pan-Am's ocean! . . . Young Vittorio Mussolini's book labeling war as "the quintessence of beauty", and that bombing the wretched, defenseless Ethiopians is doubtless the most horrible anything that has come out of the fascistic cauldron. And when he says "It was exceptionally good fun" bombing a group of horsemen, he reveals himself utterly unchivalrous hence unairworthy. That boy had better stay on the ground, he'll kill himself sure. His kind don't survive in aviation.

The 1937 West Point contribution to Randolph Field is alarmingly alcoholic. The spanking new young shavvies down there think it's manly to be two-bottle boys. Which is a nice way to wreck airplanes and the taxpayers' investment. Not to mention giving this nation a slightly pickled national defense. . . . M. S. "Mose" Hutchins, of Rochester, heads the company that is handling the *Cub* 1938 advertising campaign. It is the first time airplane merchandising has stepped into the pages of general magazine advertising. Which is one way to awaken non-technical publications to flying potentialities in this

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country. . . The remarks here, in the December issue, about the American Legion convention pulled some very funny mail. All of it was from writers who got sore-headed and called me names. One of which I answered as follows:

"My dear Paul Meredith:

"Thank you for your letter of Nov. 7th. It is truly appreciated. Nor am I jesting when I say this for your letter opens, I hope, the door for you and I to get together.

"Won't you give me a call soon and maybe we can sit down for lunch. I want you to see just what sort of a palooka, and how uninclined toward anything that smacks of the dictatorial I am. Do come in and let's iron out a lot of things. Cordially yours."

(Note: The letter came back marked, "Not Found at this address").

END

Letters! Letters!

(*Continued from page 76*)

Facts . . .

Sirs:

I am graduate student of this department working for my medical and Doctor of Philosophy degrees. Of course, I want you to understand that what I am about to state is purely my own idea, and in no way is to be taken as the beliefs of anybody except myself.

Inasmuch as I am intensely interested in research in both the fields of medicine and aviation, it is not unusual that I should have some very strong convictions about the status of our amateur aviation activities.

Of course I am aware of the defects in depth perception caused by diplopia. Normally, depth perception is brought about by the ability of the brain to analyze a single object perceived at slightly different angles. If however, due to lens deficiency or muscular coordination, or any of the many other pathological causes, the image of the object falls on non-corresponding points of the retina of each eye, then the phenomenon of double vision occurs. Often intoxicated people lose fine muscular coordination, then the two eyes are unable to focus and the result is an individual image in each eye which the brain records as distinct object—or double vision. Now in congenital or prolonged double vision, the brain learns to disregard one of the images.

In a case of this kind it is easy to fool or trick the person's sense of depth perception when a new test is applied, merely because the brain has no precedent upon which to make an analysis. However, that same person, under all normal conditions, has normal or close to normal depth perception because of training. In fact, without training and experience no sense perception would have meaning, because analysis would be lacking. For example: a baby—a perfectly normal baby—is functionally deaf, dumb and blind. It would crawl off a cliff because the perception of height would mean nothing to its brain in the absense of any previous experience.

It would grab a hot poker. It would crawl in front of a whistling locomotive, because the warning noises and sights which spell danger to us mean nothing.

Mr. Karant is handicapped only so far as the *ease* with which he learns to make depth analysis. Undoubtedly, as far as anything within his normal experience is concerned, he is able to make as accurate an analysis as the person with perfectly normal binocular vision. Naturally, if he is arbitrarily prevented from going into the air, his depth perception will never improve. Evidently it must be good enough even now, inasmuch as he has been making successful flights. In the last analysis, scientist and laymen alike agree that the proof of any pudding is in the eating. All of which leads me to say that it takes unmitigated arrogance and stupidity to tell a man what he can do and what he can't do within the bounds of our normal social order.

Special legislation and extraordinary regulation almost always is the product of the bigot, the unscrupulous politician or the misguided zealot. Leave people alone to their own devices and their own pursuit of happiness.

I have built and flown my own airplane—which is naturally unlicensed. In doing so, I have defied the laws of practically all the midwestern states I have flown through since I started flying in 1930. In 1931 I held a license, but with the many insulting Sunday School regulations heaped upon us I decided I would join the "outlaws"—the unlicensed-pilot army.

I have flown for over 600 hours, in all kinds of airplane (licensed and unlicensed) and have as yet no reason to change my status.

Mr. Karant is absolutely correct when he says that the public will never become aviation-conscious while so many foolish, unnecessary intimidating regulations are imposed on them. POPULAR AVIATION can go a long way if it can show sufficient strength—and that means support from its readers.

S. J. S.

Illinois.

We had no idea so much evidence of governmental bureaucracy existed. The excerpts of letters reprinted here are only part of the flood of mail we have received on this subject. In our opinion, these letters are the most conclusive evidence obtainable. A surprising feature of the aftermath of "They Said I Couldn't Fly" is that we have yet to receive one letter that approves the vise-like grip the Bureau of Air Commerce now has on the amateur and private flyer. This evidence is invaluable ammunition. We want all we can possibly get. If you can supply us with more, please do, for POPULAR AVIATION *fully intends backing up its stand in behalf of the private pilot in this country —The Editors.*

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The Lieutenant Flew the Mail

(*Continued from page 22*)

on up to 8,000 feet. There was no use trying to find a hole in stuff as thick as that was. It got colder and colder as I went up and I was so damned chilled already that my brain was numb. I thought I might as well bail out and get it over with. Well, I got out of my safety belt and got one leg over the side. Then I reached down to cut the switches before I left her. But I hated to kill the engine. I got to thinking about the way she was going to smack the ground and I felt pretty bad about making such a mess out of things.

"All of a sudden I says to myself: 'Hell, I ain't gonna be no damn fool. I might get down and find a thousand feet of ceiling below here.' So I climbed back in and started down. I held it in an eighty mile glide. After a while I got down to a couple of thousand feet. I began looking down to see if I couldn't see something. After I got down to a thousand feet I began looking pretty hard. But I kept on squashing down with a little motor on. Well, I got down to 500 feet and I still couldn't see a damn thing. I hated to give up then, so I kept easing on down. When I got to 300 feet I was expecting to hit a hill or a smokestack or something every minute. I was looking over the side so much that I nearly spun-in from not watching the instruments. But I sort of held my breath and went on down just a little bit lower. And just as I gave her the gun to get back up out of there, I saw a faint sort of glow down to the left. I swung around over that way and saw it was a town. I circled around it, but I could just barely see the lights and that was all. It was still snowing to beat the devil.

"Well, I went out to the edge of town toward a big patch where there wasn't any lights. I figured it might be some kind of open field and I pulled a flare. Soon as the flare lighted I could see there wasn't any trees or buildings in that patch so I circled around to land. But when I started to come in I couldn't see a damn thing but snow. You see, the flare lit-up the snow in the air and it blinded me. All I could see was bright, white snow—couldn't even tell where the ground was. So I thought 'Hell, this ain't no good' and went back over town to think it over. I could see the lights just enough to tell when I was flying level. Pretty soon I decided to try something else.

"I went back over to the field and picked out what looked like the best side to come in on. Then I dived real low and pulled the other flare. It lit-up about the time it hit the ground and laid there and burned. That was fine because I could tell where the ground was. So I cut around again and came in past the flare. It blinded me so I couldn't see anything ahead, so I just sat there and pulled the stick back when I got down even with it and hoped I wouldn't hit anything very big. The plane dropped a few feet and the first thing I hit was a ditch. I hadn't any more than touched the ground when I hit it.

"The old airplane bounded right straight up into the air, must have been 20 or 30 feet. I thought I had busted the landing gear and everything but I had to give it the gun and shove the stick forward to keep it from coming right back down on the tail. Then I let it settle again. It hit the ground pretty hard and hadn't any more than started rolling when I hit another ditch and went right back up into the air. I had to straighten her out with the gun again and I thought 'What a fine field to land an airplane in.' She came back down pretty hard next time and gave me a hell of a jolt and bounced some more, but I thought 'Holy Moses, I can't keep this up all night; I must be about to run out of field or something by now!" So I shoved the brakes on hard and the old tail came up like she was going on over on her back. I blasted it down with the throttle just in time, and put the brakes on again. That made the tail come up again, but not quite so high, so I cut the switches; I was afraid to go forward any further. Well, it didn't quite nose-up. The old tail dropped back down with a hell of a thump and then everything was quiet. It was so damn quiet it just didn't seem possible. I just sat there in the plane for a minute, not thinking about anything at all.

"Then all of a sudden I heard the God-awfullest racket coming from over toward the town—sirens and bells and horns, and pretty soon an ambulance comes tearing up to the edge of this field I was in and then another one and a fire truck and a lot of cars.

"Well, sir, I just sat up there like a dummy, taking it all in and wondering what it was all about. I could hardly realize I was on the ground. Then a lot of people came running out through the snow and I just sat up there and stared at them 'till I heard somebody yelling up at me: 'Lieutenant, are you killed? Are you hurt?' That sort of got my brain to working again so I hollered back, 'Hell no, I'm not hurt. Somebody help me get this mail outa here.' Soon as we got the mail out and into one of the cars I thought I'd better look the plane over to see what-all was busted. Well, sir, you know the sonofoagun wasn't hurt at all! Couldn't find a thing wrong with it. But if it hadn't stopped right there it would have been just too bad. Right square in front of us and just a few yards away was a ten-foot levee.

"We got the mail on a train right away and then the mayor of the town took me right up to the best hotel as his guest. Said I could have anything I wanted. Everybody sure treated me swell, like I was a hero or something. I almost hated to leave the next day."

"Have any trouble getting out of that field?" I asked.

"Plenty. Couldn't get out at all. You see, I had landed in their municipal gardens."

"Their what?"

"You know. One of these places where the city lets people farm for something to eat, to keep from having to feed them. Well, this one was all divided and cut up by drainage ditches that would have put me on my back when I landed if I hadn't been lucky as hell."

"How in the world did you get out?"

"Took offa the damn levee! Yeah, the mayor got a gang of fellows out and they scraped the top of the levee till it was pretty level and then pulled the airplane up on it with a team of mules. By the time they got everything ready for the takeoff it looked like the whole town was out there."

"Have any trouble staying on the levee while you were taking off?"

"No, that didn't worry me. What worried me was that I didn't have enough run. I didn't know whether I could make it or not. I had them pull the old plane back as far as they could and then I got in and ran her up to see if everything was all right and then I got out and looked the situation over again. I was plenty worried. I knew that even if I made it, it was going to be awfully close. But I couldn't back out then. Hell no, not with all those people out there. I says to myself, 'Well, old boy, it's too late now. All these people came uot here to see you bust your fanny and you can't disappoint 'em.' So I climbs in again, with this old 'do or die' feeling, you know. Of course I knew that if she didn't get off soon enough there wouldn't be anything I could do. Well, just as I got ready to end the suspense the Mayor comes running up and says 'Lieutenant, do you think you can get over that tree?'

"'Well, Mayor,' I says, 'I'll tell you the truth. I don't know whether I can get over that tree or not.'

"And the Mayor says 'Cut it down!'

"Well, they cut down the tree. Pretty big tree, too, but it didn't take 'em long. And then on the other side of the tree was a house. And the Mayor says, 'How about that house, Lieutenant, can you get over it?' And I says 'I think I can, Mayor, but I can't say as I am positive."

So the Mayor says 'Burn it!'

"Then they burned down the house. Poured some gasoline on it and struck a match and it didn't take long. Just an old shack anyway. Well, the coast was pretty clean then, so I shook hands with the mayor and told him 'much obliged' and took off."

"Of course you got out all right," I observed, "or you wouldn't be here. Sounds like that mayor was your pal. Could you tell me how you would have come out if they hadn't cut the tree and burned the house?"

"Yeah. I'd have missed the house all right. I'd have hit the tree."

END

Airships

(*Continued from page 52*)

medical, scientific and commercial use, except that helium may be sold for the inflation of such airships as operate in or between the United States and its Territories and possessions, or between the United States or its Territories and possessions and foreign countries."

No doubt the continued success the Germans enjoyed for so long made them indifferent to helium, also the 8 percent greater lift of hydrogen was enticing. In the light of what happened at Lakehurst further use of the deadly gas at present is repulsive. But the writer believes they will gradually drift back to hydrogen when it is apparent the United States is surpassing them in this field. The loss of the *Hindenburg* then will be charged off to sabotage or some other reason plausible enough to regain the faith of those willing to ride in a ship inflated with hydrogen

America has more to gain than any other country from the commercial airship. Ready accessibility to far flung trade centers is of prime importance. There is nothing impossible about our attaining world leadership if we but put our minds to it. If its attainment were easy and effortless, we would require no incentive to strive.

We learn but little from immediate success, much from failure, the valuable lessons learned in the loss of the *Shenandoah, Akron* and *Macon* are beacons lighting the way to what is and what is not good operating and building procedure in our future efforts. The late Admiral Moffett, shortly before he went down with the *Akron*, left a slogan that might well be framed and placed in the control room of our next airship. These inspiring words were "We Can If We Will." America, after giving so much and being blessed with the only safe lifting medium for lighter-than-air craft, should not continue to be just an interested onlooker but vindicate the faith of those who gave their all and not let their memory go down in history as failures, while a recently vanquished nation shows it can be done.

It is inevitable that commercial airships applied internationally will have a direct influence in steering a greater volume of business to the doorsteps of those giving it such employment. It is up to America to step out and get some of this trade with a new merchant marine, the rigid airship.

END

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. . . THAT with all four of the Wright Cyclones roaring full blast, the Martin Ocean Transport can take off the water with a gross weight of 63,000 lbs. in 35 seconds—about the time it takes an average pedestrian to cross a normal street.

. . . THAT the Cyclone-powered Martin Ocean Transport could cruise nonstop from New York to London (a distance of 3,465 miles) in less than 24 hours and if necessary 1,000 miles beyond (shades of Christopher Columbus).

. . . THAT the maximum speed of the Martin Ocean Transport is close to 200 miles per hour, while the cruising speed ranges from 145 to 170 m.p.h. with full load.

. . . THAT the passenger cabin of the Martin Ocean Transport provides deluxe accommodations for 46 passengers by day and 26 in roomy berths at night. A completely equipped steward's galley provides for the preparation of meals; retiring rooms have all modern toilet facilities; complete sound-proofing of passenger sections reduces the noise level to a point where it is quieter than a modern Pullman train.

. . . THAT the bridge-like strength of the wing of this giant plane could support over 100 automobiles stacked deck on deck on top of it—totaling 134 tons of weight. Its square feet area—2300 square feet—is sufficient surface on which to build three ordinary houses.

. . . THAT the four Wright Cyclone engines which provide the Martin Ocean Transport with 4,000 horsepower are of the G-2 type geared to 16 to 11, similar to those used to power the twin-engined Martin Export Bombers.

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The National Air Board Says . . .

(*Continued from page 56*)

them nothing when the Federal government foots the bill is of course entirely fallacious. Washington draws its resources from taxation of the citizens of this country, and when money is siphoned from citizens to Washington and then redistributed, the actual cost to the country as a whole is of necessity very much greater than when money is collected and spent locally—a particularly serious situation when the national budget has been unbalanced for so many years. The WPA had spent $123,000,000 in the most inefficient and wasteful fashion, achieving results which might have been attained or surpassed at a fraction of this cost. Mr. Wilford pointed out that the city of Philadelphia has made a better job of finishing off and equipping the government-filled land at Hog Island than any government agency, such as the WPA, could possibly have done. Local authorities already had in their park commissions splendid organizations and personnel for grading and maintaining fields and runways. The intervention of the Federal authorities via the financial route, also meant the heavy hand of government in bureaucratic control.

A Resolution Unanimously Passed

After argument and counter-argument, the Board unanimously passed the following resolution, which was to be transmitted to Colonel J. Monroe Johnson, Assistant Secretary of Commerce:

1. That a national airport policy in the matter of airports was imperative not only in the interest of aviation, but in the paramount issue of national defense.

2. That cooperation between Federal, State and Municipal authorities was highly desirable.

3. That some degree of Federal aid to the municipalities was desirable, coupled with advice or technical assistance, but without domination of local authorities.

Can Steam be Used for Aircraft?

George and William Bessler are steam power plant enthusiasts. For many years they have upheld the contention that light steam power plants are more suitable for railroad operation than Diesel electric combinations and have already converted many railroad authorities to their view. Perhaps our readers will also remember that the brothers just a few years back startled the aviation world by installing a light steam engine in a two-seater airplane and making perfectly satisfactory flights. It was a great opportunity for members of the Air Board to secure from these gentlemen first hand information as to the possibilities of steam for aircraft.

The *advantages* of steam for aircraft are two-fold. Silence and complete reliability. A well designed steam engine could be used for 2,000 to 3,000 hours in an airplane without any overhaul and practically without servicing, and could then be scrapped without any financial sacrifice.

But there are many *disadvantages*. First of all there is real complication, because so many integral parts have to be coordinated: boiler, burner, engine, condenser. At sea level the condenser becomes no

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enormous that it is hard to incorporate it in the airplane, and the weight of the condenser doubles the weight of the steam engine (already heavier than the internal combustion engine of corresponding power). But the greatest disadvantage of all is that the fuel efficiency of the steam engine is far lower than that of the gasoline engine.

The conclusion is the for all flying *as we know it today* the steam engine is hopeless.

Steam in the Stratosphere

But if steam is hopeless for the flying of today, it may prove most promising for the flying of tomorrow in the stratosphere. The steam turbine, if allowed to exhaust at the pressure corresponding to an altitude of 36,000 feet, gains 36 percent in efficiency. At the low pressures and equally low temperatures of great altitudes, the condensers can operate at high vacuum, and become so much smaller that the surface of a metal wing would probably suffice for condensing purposes.

The Bessler brothers made the definite prediction that stratosphere flying would give steam a new lease on life.

A Revolutionary Type of Supercharger

The Besslers further told the Board that they were now engaged on a really revolutionary development. They are developing a new type of exhaust gas turbine supercharger, so efficient and so powerful that at high altitudes they will be able not only to maintain the engine power at its sea-level figure, but to have power left over for delivery on the propeller shaft! The overall efficiency will then be so high that the fuel consumption will fall to .34 pounds per horsepower hour (as compared with the .45 or .5 pounds per horsepower of the best gasoline engine of today). Moreover they are planning to supercharge the air at ground level to 2 atmospheres, while reducing the compression ratio in the cylinder to only 3 to 1. Thereby an engine of the size and general design characteristics of the Ford might be made to deliver 300 h.p. and still be perfectly robust and reliable. The highly technical problems involved cannot be discussed here.

Insurance for the Private Flier

Aviation insurance has had many vicissitudes. Many companies started writing aviation insurance in 1920, lost a great deal of money and gave up in disgust. Not a single one of the companies who started writing aviation insurance are now in this business. There are however, very fortunately three powerful pools or groups who cover the field adequately, and have the highest reputation for integrity and responsibility. Third party liability insurance has dropped 50 percent in the last seven years. Comprehensive insurance for fire, wind, theft or accident on the ground in connection with airplanes is now only 3½ percent per annum. But flight insurance, crash and injury is still very high, 13 or 14 percent per annum. A good many people buy a ship, consider the insurance prohibitively high, do not take out insurance, and when their ship is "washed out" give up flying in disgust.

There is a vicious circle in aviation insurance. Because insurance rates are so high, enough people do not insure. And because comparatively so few people insure, there is not enough distribution of the underwriter's risk for the cost of aviation insurance to go down.

NATIONAL AIR BOARD MEMBERS: Richard Aldworth, A. Raymond Brooks, Ray W. Brown, Reed M. Chambers, Richard H. Depew, Jr., William C. Fleming, Betty Huyler Gillies, Randolph F. Hall, C S. "Casey" Jones, C. L. Ludington, J. S. McDonnell, Jr., Augustus Post, George B. Post, Dean C. Smith, Earl R. Southee, James B. Taylor, Jr., D. W. Tomlinson, Grover Whalen, E. Burke Wilford, R. C. Wood (Paris) and W. C. Young.

END

SILENCED AIRCRAFT

?

WILL the warplane of the future sweep silently over enemy territory, wreak its havoc, then slip silently back to its roost? The March issue of POPULAR AVIATION will contain an enlightening article on this important subject. Other gems in this issue will include exclusive photographs of the ultra-new Brewster and Grumman fighters and the giant new Consolidated XPB2Y-1. And there will be dozens of other startling photographs and articles. Be sure you get the March issue of

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Stressing Airplane Wings

(*Continued from page* 58)

consideration wherein the monoplane maintains a substantial edge. The attached drawing of Figure 4, illustrating two current, widely-used types of military aircraft, indicates the wide difference in the frontal area presented by a well-designed monoplane and biplane. The monoplane type of structure makes available the utilization of the thick airfoil section in conjunction with the internally-braced, or cantilever, wing spar members. This construction incorporates excellent aerodynamic characteristics, high lift, and extreme cleanness of design with no external bracing members being exposed to contribute to the overall drag. The internally-braced, cantilever airfoil section becomes particularly adaptable to the conventional low-wing monoplane which possesses ideal stability and safety characteristics, and makes possible various arrangements incorporating excellent visibility—incidentally a factor of paramount importance relative to military application. The thick wing section also lends itself admirably to the accommodation of fuel tanks within the ample space thus presented. The above-mentioned arrangement does not become readily adaptable to the biplane structure. The author recalls only one instance wherein construction of an aircraft incorporating superimposed cantilever wings was proposed. During the latter stage of the Great War one such type of airplane was built under the Christmas patents and investigated by the Navy Department. However, tests preceding scheduled quantity production proved unsuccessful and the project was formally abandoned.

All of the above-presented data can be summed up in the general statement that the monoplane type of structure maintains a favorable advantage over the biplane in that it possesses a higher lift-drag ratio. In general, assuming an average value for several current airplane designs, the lift-drag ratio for the former structures exceeds by approximately ten per cent that of the latter types. This factor is reflected in materially increased performance characteristics including higher speeds, ability to transport greater payloads, and an increase in the general operating efficiency of the aircraft due to utilization of a greater proportion of the power plant output.

In general, however, the biplane, due to its somewhat better truss arrangement, can be constructed lighter than the monoplane. The resultant compactness and reduced span length thus made possible becomes of notable importance, particularly from the viewpoint of the private flyer with whom the problem of storage space is very likely apt to represent a paramount consideration. As the biplane wings become relatively short and small, torsional deflection represents less of a problem than that encountered with the increased span of the standard monoplane airfoil. In military aircraft, subject to extensive acrobatic maneuvering, the high degree of torsional rigidity incorporated into the biplane structure with its diagonal bracing system tends to introduce a rather favorable aspect relative to the application of this type in the service field. Due also to the inherent factor of torsional rigidity, biplane wing structuces, even in the case of large-type aircraft, can be readily constructed so as to follow the conventional single-spar and two-spar fabricated designs. This type of construction makes for lightness as well as economy and ease of production. The application of two-spar construction to the large cantilever or internally-braced monoplane would hardly prove feasible with conventional forms of construction since concentration of the applied loads upon only two spars would necessitate the employment of construction materials of such ponderous dimensions as to prove extremely difficult of fabrication. However, the prevalence of torsional flexibility, which we can readily perceive as being particularly detrimental to monoplane design, can be offset by incorporating a particularly rigid drag truss into monoplane wings of extremely high aspect ratio. The application of plywood and metal wing coverings also tend to introduce torsional stiffness with the consequent flutter pre-

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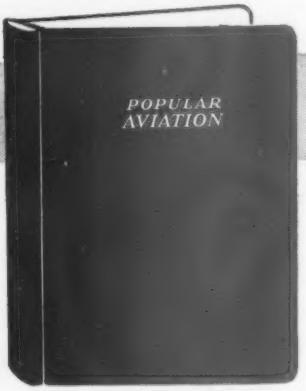

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vention while, in some cases, they also assist in absorbing the beam forces, thus effecting a resultant reduction in the theoretical dimensions of the wing spar sections. Spars formed if built-up channel sections employed in conjunction with plywood, and both corrugated and flat-sheet metal wing covering have proven substantially effective in the design of cantilever monoplane wing construction for the largest and heaviest types of aircraft.

The externally-braced monoplane as well as the sesquiplane represents a compromise between the biplane and the internally-braced monoplane incorporating, as they do, the structural superiority of the former type with the aerodynamic advances of the latter type. The externally-braced monoplane, including both the strut-braced and the tie rod-braced types, simulates conventional biplane construction, insofar as stress analysis is concerned, in that the spars constituting the inner bays are subjected to end loads. This loading condition introduces eccentric moments, requiring the wing spars to be analyzed as eccentrically loaded columns under initial side load. Consideration must also be given to secondary shear, the shear component of the end load on the deflected wing spar, with both the continuous-web beam and the trussed beam, these two types being most extensively employed in aircraft construction. This factor becomes of increasing importance since the secondary shear tends, in many structural applications, to approach a value equivalent to that of the normal shear.

The methods of stress analysis become increasingly difficult when applied to the wings of varying cross-section which find employment with both the externally-braced and cantilever types of monoplane structures with the objective of incorporating a saving in weight. The "precise equation," as applied to conventional biplane wing spars of uniform cross-section for the purpose of determining the ultimate stresses developed therein, has its use prevented in the former application, thus necessitating the utilization of some other, and more complicated, method of solution.

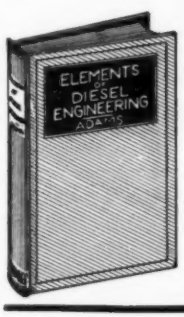
A pronounced stability factor is incorporated into the biplane structure through the employment of decalage, the increase in the angle of incidence setting of the lower airfoil of the assembly with reference to that of the upper airfoil member. The resultant combinations of lift forces function in that they tend to prevent stalling when the aircraft, thus equipped, operates under the high angle of attack condition. This arrangement also materially assists the pull-out preceding recovery from a dive.

One of the greatest contributory factors toward the attainment of inherent safety characteristics in airplane performance lies with lowered values of landing speed. This desirable feature infers a reasonably low vertical velocity or sinking speed which varies inversely with the lift-drag ratio of the aircraft involved. Low landing speed can be readily attained at the expense of the overall performance characteristics of the airplane under discussion by designing the structure with a light wing loading or with an originally low value of horizontal flying speed. The ideal condition lies in the combination of high performance characteristics for the condition of horizontal flight with a low landing speed. The slight edge of the biplane structure in this respect is very probably offset by the extensive employment of flaps and various other apparatus to extend the original wing area on recent production monoplane types. The following tabulated data gives the relative characteristics for light airplane types of average performance:

Type	Actual Sinking Speed	Landing Speed	High Speed	Wing Area	Span Load (lbs.)
Conventional Biplane	15.5	46.2	89.3	338	55
Normal Monoplane	25.2	58.2	98.8	136	66
Extended Area Monoplane	20.0	44.5	78.8	166	66

It can readily be seen from the above that for approximately one-half the wing area a lower value of landing speed is obtained for the extended area monoplane than for the biplane, with a correlative increase in the sinking speed approximating 5 miles per hour. The normal monoplane has had its landing speed decreased approximately 14 m.p.h. through the application of the extended area principle with a corresponding decrease in sinking speed approximating five m.p.h. Practical adaptations of the extended area principle assume the form of wing slots and wing flaps. Wing slot installations function primarily in effecting an increase in the lateral stability characteristics of the airplane involved when tending to stall, their influence upon the reduction of landing speed being definitely a secondary consideration. Relative to wing flaps, it can hardly be predicated for the entire category of such members in all their variations that they will definitely effect a reduction in the vertical velocity or sinking speed. In some cases they are apt to increase this quantity since they tend to increase the parasite drag with a consequent reduction in the overall lift-drag ratio. In addition, the installation of wing slots and flaps tends to complicate the structural and maintenance features of the aircraft involved.

END



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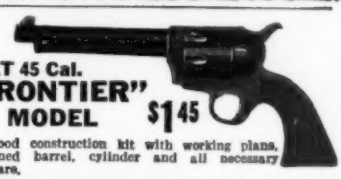

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Van Orman
(Continued from page 16)

tinued to write my observations of what the balloon was doing, in my little notebook.

"But instead of bouncing back up as I had expected, the basket never gave the slightest suggestion of a bounce. Instead it submerged to the depth of three feet in the icy lake waters.

"I looked at the young students' faces, and saw that they were really frightened. 'Throw over eight bags of sand', I ordered calmly as if I was absolutely unperturbed myself. But the throwing over of eight bags of sand, which ordinarily when the balloon was in the air, would have caused it to rise quickly to three thousand feet, here in the lake had absolutely no effect on the craft. Cutting off the drag-rope, which was my next move, also had no effect.

"About this time, one student officer valiantly offered to wrap up the coat of his brand new uniform and throw it overboard in hopes of lightening the craft. I told him that wouldn't help much, but I did insist that everyone stand on the bottom of the basket in order not to force it deeper into the water.

"Of course the speed of the balloon by this time was decreased tremendously by the effect of the basket dragging through the water. The spherical bag overhead now leaned forward thirty degrees ahead, under the force of the wind. Our craft continued to drift at about five miles an hour through the icy water.

"I noticed that our braggart was the most scared boy in the crowd, while the other four were really getting a bit of enjoyment out of the unique experience.

"Of course the next problem was how to land. After throwing over 240 pounds of sand and a 100 pound drag-rope, the balloon would rise very rapidly upon leaving the water, which was likely to occur as soon as we struck the opposite bank of the lake. It would be impossible to make a safe landing in a thirty-mile wind with no ballast or drag-rope. The safety of the five students, including the braggart, rested heavily upon me. I knew that there was just one point where we had to make a landing, and that was the opposite bank which we were rapidly approaching.

"I told two officers to grasp the rip panel which slits the top quarter of the balloon, and the mouent the basket touched the opposite shore I ordered, 'Rip'.

"The basket gave one bounce out of the water, lifted all the water in it, and the gash produced by the rip panel in the top of the balloon deflated it instantly five feet from the water's edge.

"After this interesting experience, it is needless to add that we were never bothered again with the boasting of our friend 'the braggart'."

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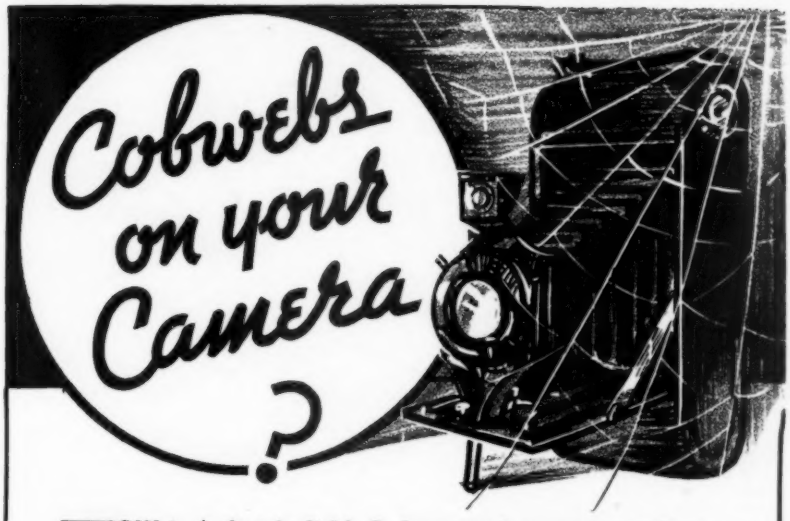

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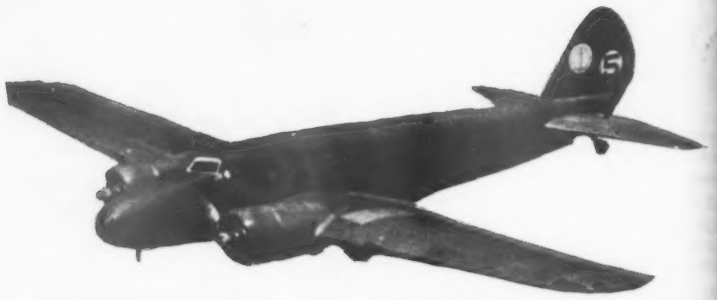

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